SCIENTIFIC AMERICAN

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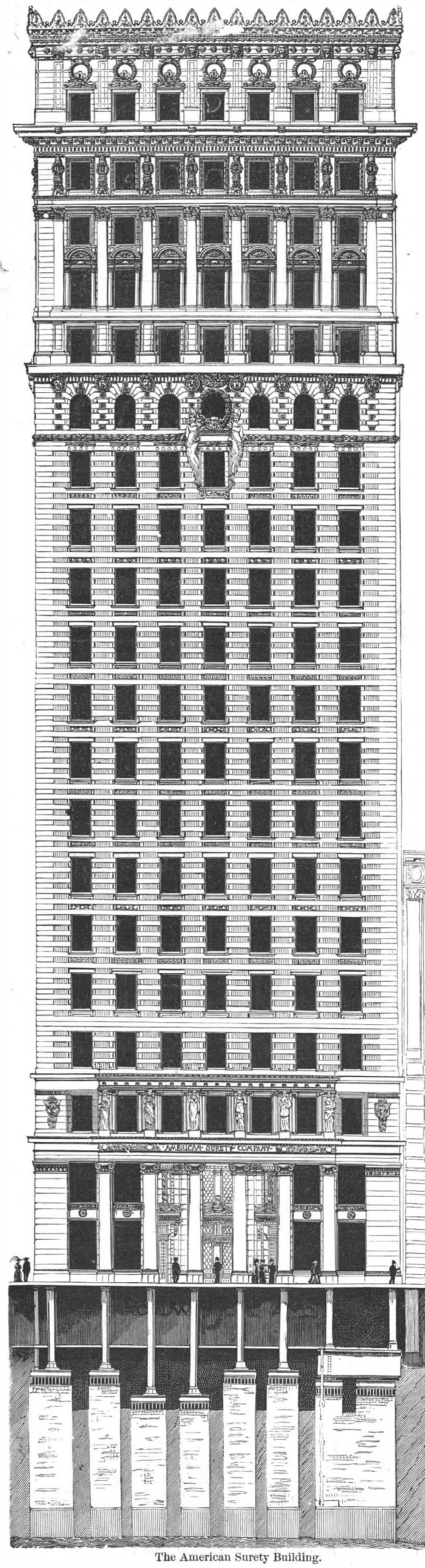
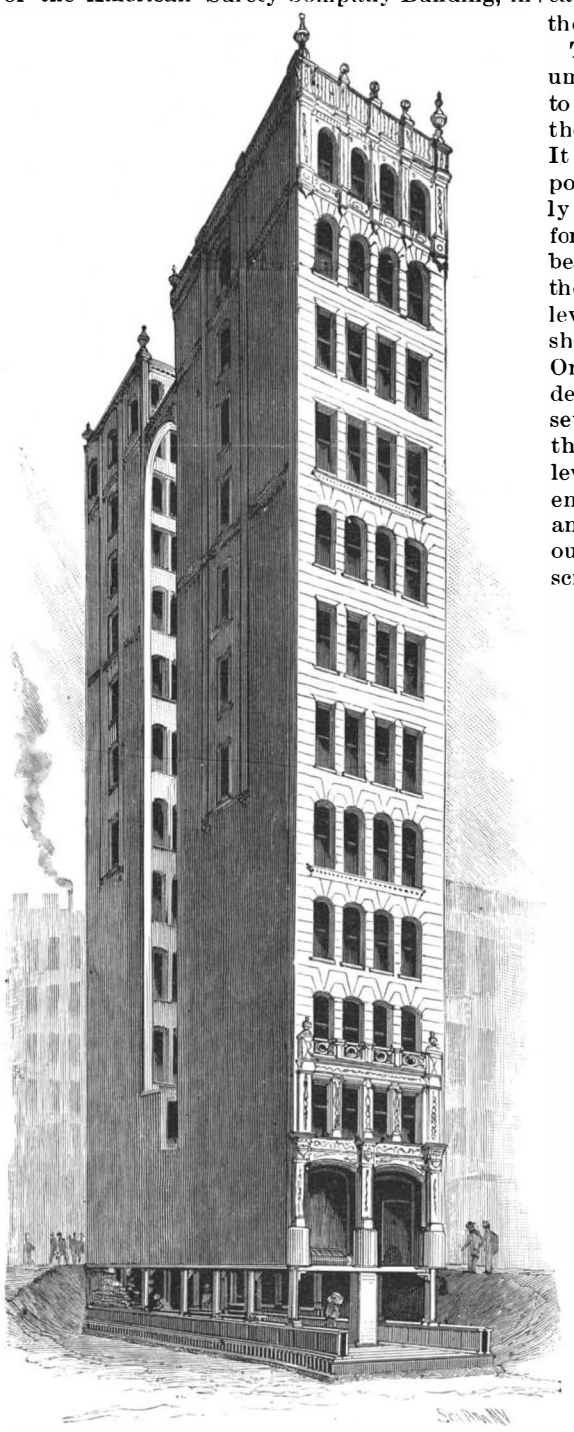


The American Surety Building.

STEEL FOUNDATIONS OF TALL OFFICE BUILDINGS.

The contour of the city of New York is undergoing a very striking change in the increasing number of tall office buildings now being erected. The construction of these buildings is made possible only by the use of steel frames. The older type of building, whether of brick, of stone, or of iron, depended for its strength upon its walls. The modern tall office building has a steel frame. This carries nearly the whole weight, and the walls, solid and massive as they appear, do not support the structure, but simply fill the interstices. It is startling to think of the entire superstructure of a twenty-story building resting upon thirty or forty columns. Yet without this modern development, without the use of steel, the walls of these buildings would have to be so thick at the lower story that there would be no room left for offices.

In a recent issue we illustrated the placing of the piers of the American Surety Company Building, in this city. This showed one of the first operations incident to the establishment of a foundation of a tall office building.



Fahys Building.

In our present issue we illustrate the construction of the steel foundation work of such a building, representing at the same time the superstructure resting on the foundations in question.

In the cuts two buildings are shown, both drawn to the same scale. The one on the left hand of the page represents the American Surety building, designed by Mr. Bruce Price, the well known architect of this city, with its foundation or substructure exposed. The building is 303 feet high from the street to the cornice line. It covers a lot approximately a square, 85 feet 4 inches by 84 feet 8 inches in area, yet none of whose sides are quite parallel. The general design of the tower-like structure speaks for itself, though much of the detail is very rich, and cannot be shown in a cut on so small a scale. At the base are shown the different piers sunk by the pneumatic method described in our issue of August 25. The bearing of the columns has to be distributed over the tops of these piers. A steel plate covers the top of the masonry. On this is placed a grillage, whose first course is made of ten 24 inch I beams weighing 80 pounds to the foot. These beams are just long enough to extend across the top of the pier, which is covered by them laid close together. Transversely to these, five 20 inch I beams, weighing 64 pounds to the foot, are laid, covering about one-half of the area, only in the center. A course of steel billets, 4 inches square each, rests on these beams, and on this third course of the grillage the base of the column is placed.

This description applies to the direct bearing columns. As this building is erected, no party walls are to be employed; the foundation had to be restricted to the limits of the lot where bounded by other houses. It is evident that a directly bearing column for some portions of the side wall would have rested dangerously near the edge of the foundation piers. To provide for this difficulty, cantilevers are employed to shift the bearing of the outside column back to the center of the pier. Referring to the large cut, one of such cantilevers is shown on its right hand, and the same is shown on a larger scale in the larger scale or detail cut. On precisely such grillages as already described, a very deep plate girder is established, which rests on two sets of steel billets, each set placed approximately over the center of a pier top. The inner end of the cantilever is held down by massive iron straps. Its outer end projects for several feet beyond the steel billets, and on its outer extremity is placed the column of the outer wall. As the building progresses, the tie just described holds the inward end of the cantilever down in

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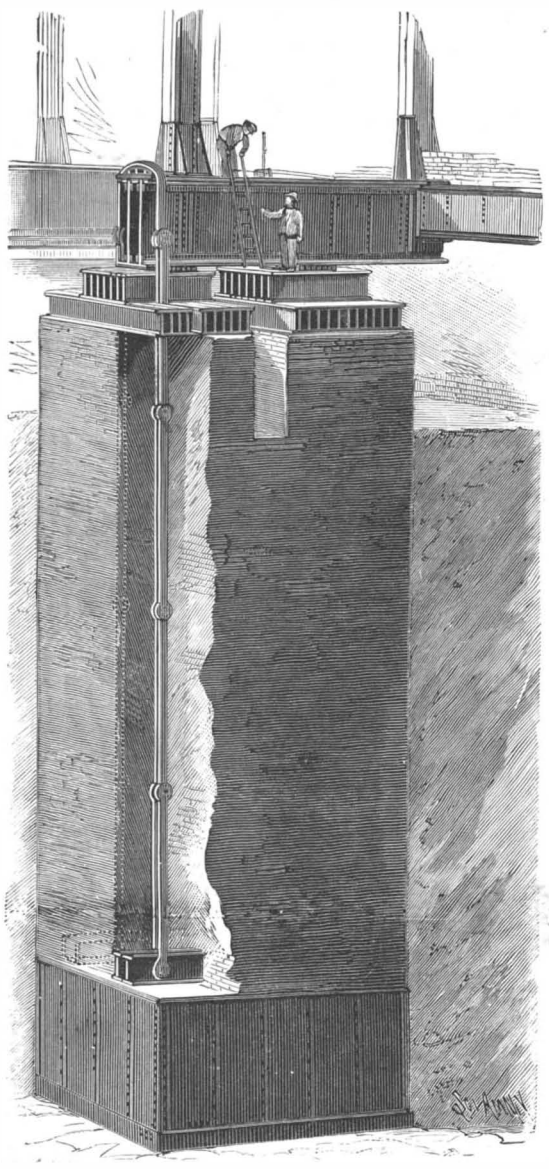

Details of Cantilever, American Surety Building.

THE STEEL FOUNDATIONS OF TALL OFFICE BUILDINGS.

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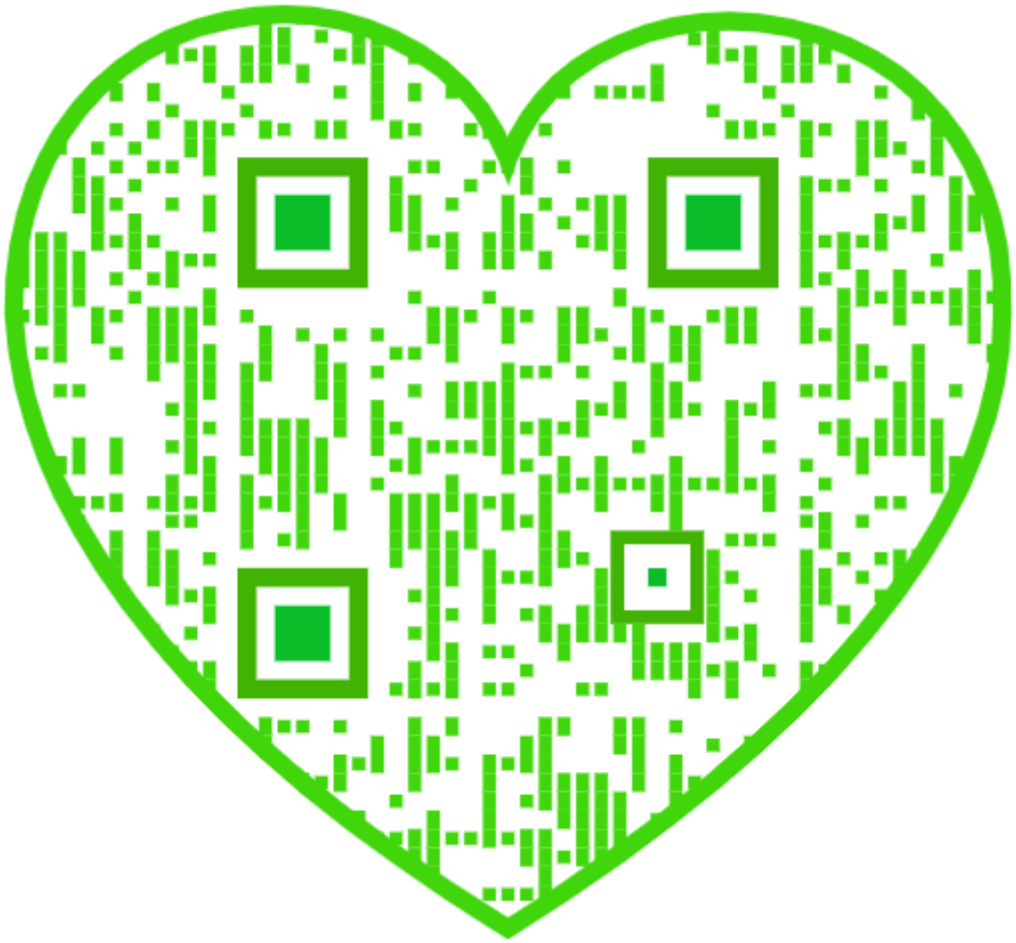

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A TORPEDO BOAT THAT RATES OVER THIRTY-THREE MILES PER HOUR.

The British Admiralty is adding a large fleet of fast torpedo boats to the navy, several of which, already completed, are faster than any boats in the world. The latest example is the Ardent. This boat is 200 feet long, 19 feet wide, 14 feet deep. Her engines are 5,000 horse power, built by Thornycroft & Co. On trial November 9, making two runs with and against tide, her mean speed was 29·18 knots per hour, or a little over 33½ miles per hour—the fastest velocity ever attained by a steam vessel. At the above speed there was an absence of the usual vibration and but little flame at the tops of the chimneys. The Ardent is a wonderful boat. We need not enlarge upon the importance to our own navy of the possession of vessels equal in speed to those of other nations, and it is to be hoped Congress will lose no time in providing for their construction.

THE NEW BROOKLYN BRIDGE STATIONS.

The work of enlarging the terminal stations of the Brooklyn Bridge is being rapidly advanced, and something of their ultimate design is already apparent. With the new system of tracks and platforms, trains may be run across the bridge every 45 seconds, instead of every 90 seconds, as at present. The present carrying capacity of the cars is 16,000 per hour, and this will be increased to 32,000 persons per hour. There will also be an entirely new arrangement of stairs and passage ways for reaching the street and the elevated railroad stations. The exacting requirements of the new stations and the limited amount of space available for carrying them out make the work very interesting from a mechanical standpoint.

The platforms in the new stations will be much wider than the present ones, and tracks will be laid on each side of them. The trains will be run to and fro on both sides of these platforms, thus making it possible to load and unload two trains at a time. At present the work on the station at the Brooklyn end of the bridge is much farther advanced than on the New York side. The framework of the building is in place and the work of putting on the roof is already well under way. The outward appearance of the station will be much the same as the old one, but the interior arrangements will be widely different. The Brooklyn station now extends from Sands Street to High Street, although it will ultimately extend on its north end as far as the north side of Sands Street. This part of the work, however, will be delayed until the Brooklyn elevated railroad has finished its connection with the bridge, and the present elevated railroad station has been removed. The new bridge station will not be used until both of the elevated roads are ready to bring passengers to its southern end. The Brooklyn elevated road intends to run through the northern end of the bridge station, then to encircle the plaza and pass again through the station at its southern end, thus forming a continuous loop and avoiding the trouble of switching. According to Superintendent Martin, it will not be possible to run bridge trains on the new system before next spring.

The roadways on the bridge have been widened near the stations on both sides of the river to prepare for the new arrangement. The purpose is to spread the railroad tracks wider apart than they are at present, so that the trains may be run to the outer edges of the new platform. The new tracks will therefore extend a trifle over the old roadway.

A serious objection to the new system will be the increased danger of accident incurred in handling so many trains. The new system is, however, the most perfect one possible under the present conditions. To obtain greater safety of transportation, relief can only be found by building other bridges.

THE SMALL CALIBER BULLET IN THE EAST.

In our issue of November 10 we published an article entitled "Small Caliber Projectiles." Since the appearance of this article the world has learned of the terrible wounds produced by the small bullet in the war between China and Japan. It has been known for a long time that the small caliber bullet would necessarily increase the death rate in war. In Germany the number of litter bearers has been largely increased, so that every corps now has 1,168 litter bearers; this increase was made in view of the fact that greater mortality might be expected. As far back as the battle of Gravelotte, in 1870, the superiority of the French chassepot of 11 mm. over the Prussian needle gun of 14 mm. was noted. From 1876 on experiments have been conducted to ascertain the efficiency of the new projectiles and the nature of the wounds produced by them. In the lecture delived to the cadets at Annapolis "On Gunshot Injuries Produced by the New Projectile of Small Caliber," by Henry G. Beyer, Surgeon U. S. N., printed in the Proceedings of the U. S Naval Institute, thirty-four references were made to literature on the subject, no title being earlier than 1881. The experiments were made on cadavers and animals, and showed that a great deal of the tissue was destroyed and the bones very finely comminuted. The destruction wrought by the new bullet is largely the result of the so called "explosive action." By this term we are to understand the injury produced by projectiles, which is out of proportion to the size of the projectile itself. Thus if the tissues are destroyed or pulped and the bone pulverized, the injury would be more extensive than if the bullet had merely plowed through the flesh and fractured the bone.

The captain of one of the American warships on the Asiatic station has written home of some very interesting things that he has seen. Describing a visit to the Japanese field hospital, near Nagasaki, he says:

"There I got a fair conception of the killing and wounding qualities of the new small bore rifle that all Europe is adopting. The Japanese infantry arm is the Murata, the invention of Gen. Murata, now chief of ordnance of Japan. The caliber of the gun is 0·315 and the bullet weighs 235 grains.

"I saw a Chinese officer who had been struck in the knee joint by one of these bullets, fired at a distance of about 1,000 yards. The thin steel envelope of the bullet had broken and the joint was simply a mass of finely comminuted bone splinters. The knee was perfectly soft, without a bone in it unbroken an inch long. Of course the leg had to be amputated."

The caliber of the new United States magazine rifle is 0·30 and the bullet weighs 220 grains. When this bullet was first decided upon, there was considerable talk about the new bullet lessening the mortality in war. Many persons claimed that the new projectile would, in a large number of cases, simply put the soldier hors de combat, and some even went so far as to call it a "humanitarian" bullet; but it is difficult to see wherein humanity is benefited, in view of the facts mentioned above, unless it is to assist in extirpating war, for after all a battle is a "bestial frenzy," as Leonardo da Vinci has well remarked.

A Model Tenement House.

Plans are being discussed by a number of philanthropic people in New York for providing healthful and comfortable tenement houses for the poor at reasonable rates of rent. It is proposed to build on a plot of ground in Brooklyn, 75 by 208 feet, a huge structure six stories high, to contain 408 rooms. Several of the provisions for the comfort of these people will doubtless prove of great value. A central open court, 20 feet wide, will run from the front to the rear of the building, thus providing plenty of light and air. No rooms are to communicate, but all will be easily accessible. The frame of the building is to be constructed of iron or steel, and the covering will consist of sheets of corrugated iron. The whole is to be absolutely fireproof. The building will also be supplied throughout with the most approved sanitary arrangements. The estimated cost of the building is $125,000. The rooms will be rented in suites of 2, 3 or 4, at the rate of $3 a month for each room. The stock company who expect to supply the capital for this undertaking argue that the tenement houses are a necessary evil, and that charity should be expended to the end of making them as wholesome as possible. A novel feature of this establishment will be the distinct divisions into which the house is to be divided, in order to provide separate apartments for Germans, Jews and Italians.

Steam as a Means of Defense.

A simple and effective method of repelling train robbers by discharging jets of steam upon the attacking party has recently been patented by William H. Reeve, an old tugboatman, of New York. The inventor has enlarged upon the plan long followed by railroad companies of attaching a steam jet to locomotives to scare cows and other animals from the track. The patent provides for running steam pipes along the boiler, one on either side from the cab forward. The ends of the pipes are supplied with small nozzles so formed that jets of steam may be projected through them a distance of 50 or 60 feet. It is claimed that these would prevent any person from approaching nearer than this distance. Similar pipes could be run to the rear of the train and be supplied with nozzles, rendering it impossible for any one to reach the rear platform. Other pipes could be arranged at the car doors, while by the use of flexible pipes or hose the steam could be carried and discharged from the windows at will. These pipes need not be so large as to be unsightly or inconvenient in any way.

A further use of steam as a means of defense, the inventor claims, would be in protecting banks against thieves. Since banks are usually heated with steam, the attachment could readily be made. Small jets of steam might be so arranged at the windows of the tellers that they could be projected into the faces of the robbers. These jets might be operated by hidden levers or by electrical attachments.

A more ambitious plan, however, is to utilize steam in the defense of forts, armories or arsenals. Powerful jets of steam could be discharged at doors and windows of arsenals. Forts could be protected in a similar manner, and as long as the supply of steam held out, the inventor claims, they could not possibly be carried by assault.

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The Early History of Literature.

In a most interesting article by Amelia B. Edwards, in the Contemporary Review, entitled "The Art of the Novelist," the author says:

One of the most ancient examples of fiction in the world, one which has survived the rise and fall of many an ancient and many a modern empire, is an Egyptian romance entitled "The Tale of the Two Brothers." We have the original manuscript in the British Museum. It is written on nineteen sheets of papyrus, in a fine hieratic hand, and it was penned some three thousand two hundred years ago by a Theban scribe named Ennana. This Ennana was Librarian of the Palace to King Merenptah, the supposed Pharaoh of the Exodus; and he appears to have written the tale by order of the Treasurer, for the entertainment of the Crown Prince, Seti-Merenptah, who subsequently reigned as Seti II. This prince has signed his name in two places on the back of the manuscript, these being probably the only autograph signatures of any Egyptian king which have come down to our time. This most venerable and precious document was purchased in Italy by Madam d'Orbiney, who sold it in 1857 to the authorities of the British Museum; and it is now known as the d'Orbiney Papyrus.

That the ancient Egyptians were novelists and readers of novels was what no one suspected till Madam d'Orbiney purchased her famous papyrus in 1857. The Egyptologists of Europe were, in fact, fairly scandalized to find that these "grave and reverend signiors," whose mummies were so eminently respectable, had tastes as frivolous as our own. Since that time many more specimens of ancient Egyptian fiction have come to light, tales of adventure by land and sea, tales of enchantment and magic; even historical romances and ghost stories.* These discoveries have cast a new light upon the early history of literature. They show us that Egypt was not only the birthplace of all our arts and all our sciences, but that the Valley of the Nile was in truth the cradle of romance. It was from Egyptian sources that Herodotus derived many a narrative which he innocently accepted for fact and repeated as history; and it is from these sources that the Arab story-tellers of the middle ages draw many an incident familiar to us all in the pages of "The Thousand and One Nights." "The Shipwrecked Mariner"† (who, by the way, performs the astonishing feat of sailing up the Nile as far as Nubia, and thence gaining the open sea) is cast, like Sindbad the Sailor, upon an island peopled by serpents. General Tahuti, in a story called "The Taking of Joppa,"‡ introduces his soldiers into the beleaguered city by means of a stratagem less successfully attempted in after-ages by the "Forty Thieves;" that is to say, he conceals a certain number of men in big jars which are carried by others of their comrades, disguised as captives laden with booty.

We modern novelists are well pleased when our stories find favor in many lands, and are translated into many tongues; but if tried by this test, the second part of "The Tale of the Two Brothers" throws all our modern successes into the shade. We find it reproduced in every age and in every civilized land.

The fact that novels and tales were written by the scribes of Egypt before Hebron and Zoan were founded, is indeed very extraordinary. And we must remember that these ancient romances are the parent-source of all the light literature of mediæval and modern times. The great Mesopotamian nations had apparently no school of fiction. The clay cylinders and tablets of Borsippa, of Warka, of Babylon, of Nineveh, have as yet yielded nothing in the shape of a popular tale or a popular song. Legends of gods and heroes, chronicles of victories, cold-blooded records of hideous tortures inflicted on prisoners of war, calendars, contracts, accounts, magical formulæ, and the like, have come down to us in abundance from the libraries of these grim, practical and eminently disagreeable people; but nothing, absolutely nothing, which brings them into touch with ourselves, upon the common ground of imagination or sympathy. When, therefore, we lose sight of fiction in Egypt, we lose sight of it for a long time in the East, and follow it to the West, to Greece and to Rome.

Trial of Mortar Batteries at Sandy Hook.

A very interesting series of experiments were conducted recently at Sandy Hook by the Board of Ordnance and Fortification to ascertain the value of mortar batteries in repelling the attack of an enemy. The idea was to determine how far and with how much accuracy they could be thrown when it was desired to perforate the deck of an enemy's war ship. A battery of mortars consists of sixteen pieces, and the trial consisted in setting these off singly and in groups of four. By carefully adjusting the angle of the gun, the single shots were made to hit the target repeatedly. The purpose of discharging four guns at a time was to ascertain if the shots could be made to fall at the same point. The experiments on land showed that the shots fell within a distance of thirty-two feet of each other after traveling a distance of 3,000 yards. In the case of the shots fired at a target on the water, it was found that the four shots fell so close together as to make a single splash, and every shot hit the target or came within a few feet of doing so. The experimenters declare that they were well satisfied with the result.

*An English translation of certain ancient Egyptian tales, in illustrated form, will shortly be issued by Professor Flinders Petrie.

†From a Twelfth Dynasty papyrus.

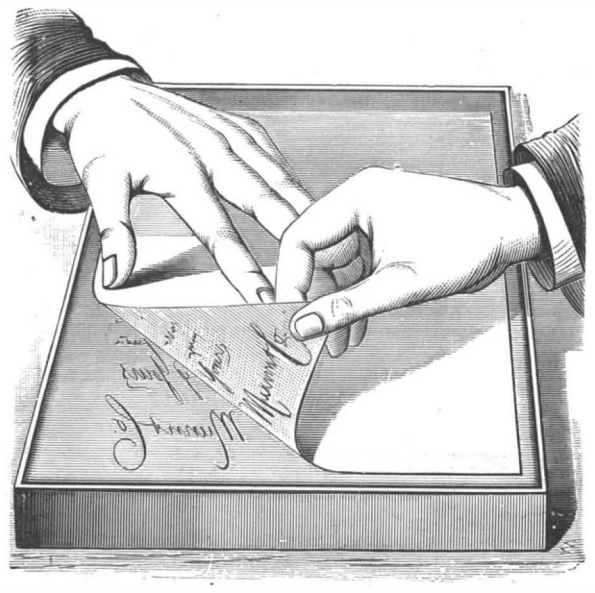
‡From a papyrus of the Eighteenth Dynasty.

EXPIRATION OF THE HEKTOGRAPH PATENT.

The invention known as the hektograph (from the Greek ekaton, hundred, and graph, write) consists in making a pad or cake of gelatine, glycerine and water. This forms a stiff jelly, and if a sheet of paper having lines drawn or written with aniline ink is lightly pressed upon the jelly, a reversed copy of the lines or writing will be received thereon. The ink is absorbed by the jelly to such an extent that many successive copies of the lines or writing may be taken by simply pressing successive sheets of dry blank paper upon the inscribed jelly. It forms a most convenient and excellent method of duplicating letters, sketches, etc. The mode of use is illustrated in our engraving.

A United States patent for this invention was granted June 1, 1880, to the Austrian inventors, Messrs. Kwaysser and Husak, and under the ordinary term of the law the patent would expire June 1, 1897. Section 4,887 of the United States Statutes, however, provides that "every patent granted for an invention which has been previously patented in a foreign country shall be so limited as to expire at the same time with the foreign patent, or, if there be more than one, at the same time with the one having the shortest term."

Several foreign patents were granted for the above invention prior to the American patent, among them an English patent, which expired November 13, 1894; consequently, the American patent expired on that



date, and the invention is now the property of the public, and any person may now freely make, use, and sell the hektograph.

An approved formula is as follows:

THE COPYING PAD.

Gelatine, by weight	1 part.
Glycerine	4 parts.
Water	2 parts.

THE INKS.

1.	Methyl violet	1 part.
	Water	7 parts.
	Alcohol	1 part.
2.	Rosaniline	2 parts.
	Water	10 parts.
	Alcohol	1 part.

To prepare the pad for use it is necessary to pass a wet sponge lightly over the face of the gelatine and allow it to nearly dry before taking the first copy. If this precaution is neglected, the face of the pad will be ruined by the first transfer.

Electric Traction in Paris.

Two electric tramways, both operated on the accumulator system, are at present in successful operation in Paris. One runs from St. Denis to the Madeleine and the other from St. Denis to the Opera, both lines belonging to the Compagnie des Tramways de Paris et du Departement de la Seine. The length of each line is about 5¾ miles. The electricity generating station is situated at St. Denis, where the accumulators for both lines are charged. The generating plant comprises three Desrozier's dynamos driven by three Corliss engines, each of 125 horse power. The dynamos, which were supplied by the Maison Breguet, of Paris, run at 600 revolutions per minute, and give 230 amperes at 260 volts pressure, being arranged in quantity.

The car chest is supported on two single-axle trucks connected together by an arrangement of springs to allow of passing round curves. Each car will accommodate fifty passengers. The accumulators, which are of the Laurent Cely type, supplied by the Societe pour le Travail Electrique des Metaux, of Paris, are placed under the seats of the car. Two batteries are allotted to each motor car, each battery consisting of 108 cells having 11 plates, inclosed in ebonite cases. The dimensions of the plates are: Depth 200 mm., width 200 mm., or 8 inches square, and thickness 0·006 mm., while the weight of the active material is 38½ pounds per cell. The accumulators are rapidly charged at a constant potential of 260 volts. The capacity of a battery of accumulators is 230 ampere hours, equal to 52 horse power hours, sufficient to run the car for a period of six hours, equal to from four to six consecutive journeys. The average distance traveled by each car is 135 kilometers per day, or about 83 miles. The efficiency of the accumulators is said to be 70 per cent. The average yield is 35 amperes on the level and 55 amperes on grades of 25 mm. per meter. In practical operation deep grades occur which necessitate a yield of 70 amperes, equal to 4 amperes per kilogramme of active material. The track consists of both Vignole rails and Broca grooved rails, the former, weighing 48½ pounds per meter, being laid in the suburban roads, while the Broca rails, weighing 92½ pounds per meter, are laid within the city limits. One charge of the accumulators would suffice for a journey of 120 kilometers on the Vignole rails and only 65 kilometers on the Broca rails. The upkeep and the charging of the accumulators is done under contract by the Société pour le Travail Electrique des Métaux, at the rate of 16 centimes (a little over 3 cents) per car kilometer, or not quite 5 cents per mile.

Coming now to the motors, these are two in number, and of the Manchester type, with Gramme ring inductors. They are excited in series, while the brushes are composed of four carbon blocks. Connection is made between the motors and the axles by two systems of gear wheels in the ratio of 12 to 1, the first series running in an oil bath. Each motor can develop, at 1,350 revolutions per minute, a total of 10,000 watts at 200 volts pressure. Under these conditions the efficiency between the terminals of the dynamo and the axles of the trucks is said to reach 73 per cent. It should be added that both the trucks and motors were supplied by Messrs. Averly, of Lyons, and that the total weight of a motor car, including accumulators, motor, and the full number of passengers, is nearly 13½ tons.

Effect of Machinery.

In mechanical weaving the progress, says the Manufacturers' Gazette, has been great, not only in the quality and character of the work done, but in the amount of production. There is scarcely a woven design that cannot now be produced on the power loom. But the advancement in power loom weaving is more appreciated in the speed at which the loom can be run and the facility with which it can be tended. In this, England is much ahead of the Continent, and the United States of the world. In 1830 the average speed of the cotton loom on plain goods was 80 to 90 picks in England, while to-day it is 195 picks. In some instances the speed is run up to 240 picks a minute. These speeds are theoretical, and indicate the possibilities of the machine. As a fact, the effectiveness of the loom is 8 to 16 per cent less, due to stoppages from various causes. The difference between the theoretical and practical efficiency of the loom is owing in an important degree to the efficiency of the operative that operates it. This is seen, somewhat, in the number of looms that one person runs, which is considerably greater in the United States than in England, and greater in the latter country than on the Continent. The records of a large weaving mill in Hyde, which has remained in the hands of the same family for the period covered, 1832–90, show an increase in the weekly production per operative of over 140 per cent, and at the same time a decrease in the unit cost of labor, while the earnings per weaver have been increased nearly 90 per cent, notwithstanding a reduction in working hours, per week, of over 24 cent. Not only have the earnings increased in this proportion, but their buying power has increased even more, or 220 per cent, based on the price of flour. According to Ellison's statistics, the productive capacity per operative increased 2¼ times from 1844 to 1880, and the cost of labor per pound of cotton manufactured declined nearly 35 per cent.

Desulphurization of Liquid Cast Iron.

The author has solved the problem by the use of the non-oxidized salts of barium, especially the ferrocyanides, which are easily decomposed by heat into iron, carbon and barium. Barium ferrocyanide is obtained by mixing the concentrated and boiling solutions of yellow prussiate and of barium chloride. A double barium and potassium ferrocyanide, obtained by mixing equivalent weights of the two salts in solution, has generally given the best results. The reaction must be effected in the exclusion of air and of every oxidizing action. On melting in a lined crucible, with the cover luted, a mixture of the sulphurous cast metal and of barium prussiate, with the addition of fluor-spar, it is easily perceived that all the sulphur passes into the slag around the ingot.—A. De Vathaire.

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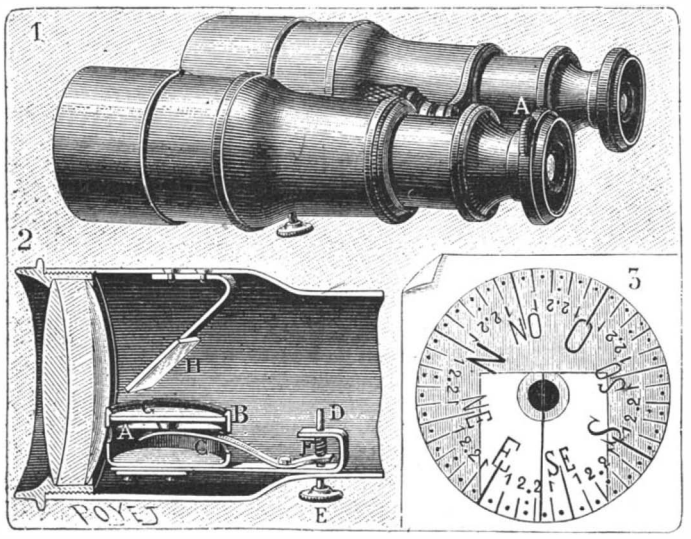
THE COMPASS FIELD GLASS.

All of our readers are acquainted with the wonderful instrument called a field glass, that permits of distinguishing objects at a distance with great distinctness. This apparatus is much used by our officers in military reconnoissances. Up to the present, however, it has had one great fault, that of giving no indication as to the exact situation of the point observed. This latter could be designated only by a few vague terms, such as to the right, to the left, etc. Mr. Geraud, a cavalry officer, has just overcome this defect by adapting to the ordinary field glass a compass that exactly determines the directions in which the observations are made.

The compass field glass, the general appearance of which is shown in Fig. 1, consists of an ordinary double field glass, in one of the parts of which is inclosed a compass with its rose arranged horizontally. Fig. 2 shows the details of construction. At A we observe, mounted upon a pivot, the movable rose upon which is fixed the magnetized needle. A flexible strip, C, terminates at F, where a spring held by a rod, D, keeps it constantly pressed against the rose, A. On the outside of the field glass there is a button, E, which permits of annulling the action of the spring, F, and of setting the rose free. The pivot and the compass are inclosed in a box, B, placed in the field glass, usually on the left side. At the upper part there is a glass, G, upon which is traced a line that serves as a datum mark for the readings. This line is directed according to the axis of the field glass, and, consequently, according to the line of sight At H there is a properly inclined mirror which reflects the rose of the compass and sends the rays in a horizontal direction.

The rose is provided with peculiar divisions for clearly fixing the positions of the objects observed. It is formed of a circle divided into eight equal sectors through four diameters. Four divisions correspond to the cardinal directions N., S., E., and W., and the four others to the collateral diameters. Fig. 3 gives the plan of this rose. One will remark the illuminated part, which is the only one visible in the apparatus. The angle comprised between a cardinal division and the contiguous collateral division is divided into ten equal parts, each of five grades.* We have entire lines marked 1 and 2 to the left and right of a median division designated by three dots. The other intermediate divisions are indicated by one dot. The reading is done by first enunciating the cardinal or collateral direction nearest the datum line, then the following direction, and by indicating the exact division occupied by the datum line. For example, in the position of the rose represented in Fig. 3 we read S. E.—E. 17 grades. Such determination will permit of finding exactly again upon a map the situation of the place observed.



THE COMPASS FIELD GLASS.

In order to render the vision very clear, it has been necessary to adopt an optical arrangement that allows the divisions of the rose of the compass to be read with great ease without, however, interfering with the binocular vision. To this effect, the head of the field glass is provided with a double convex lens set into a movable collar, A (Fig. 1). The refracting power of this lens is so calculated as to annul the concave ocular of the field glass on the one hand and, on the other, to form a magnifying lens for facilitating the reading of the compass. This lens can be easily shifted by pressing upon the movable head, A, and is therefore capable of rendering to the field glass its special properties for binocular vision.

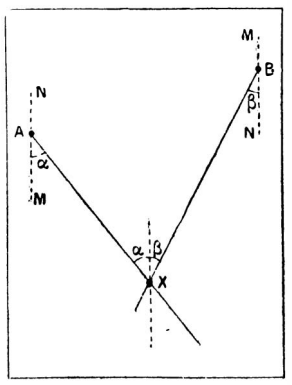


FIG. 4.—Construction to permit of obtaining the exact position of the point × upon a map by means of the observed angles α and β.

All these modifications can be easily introduced into the ordinary field glass. The instrument under consideration lends itself to a most interesting series of determinations. It is possible to recognize upon a map the point where one chances to be, to make a hasty survey upon horseback, to establish an optical post at an indicated point upon a map, etc. We shall select an example of the most practical problems for making it known to our readers.

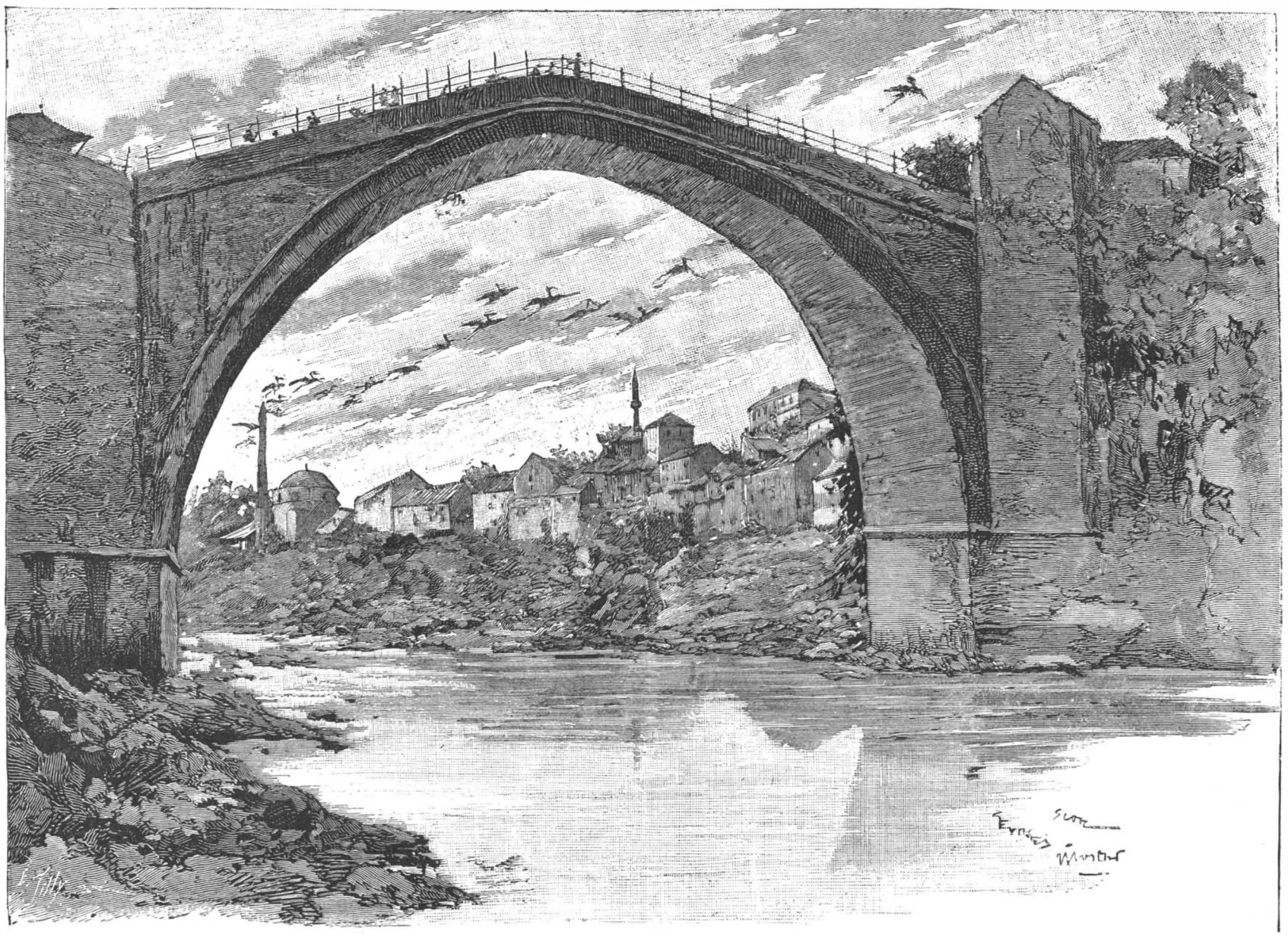
We find ourselves at a point, χ (Fig. 4), whose situation is totally unknown to us, and we desire to determine such point. In the vicinity there are two other points, A and B, such as a city, a tower, a hill, etc.—in a word, two points that we can easily observe. We take a look at these two points in succession, and note in each case the divisions indicated by the position of the compass with the datum line. Supposing α and β to be the divisions observed upon a map, let us fix the points, A and B, whose positions are known. Through each of them let us pass a line, M N, parallel with the N S direction, which is the line of the magnetic meridian in these places. The correction relative to the magnetic declination is made, and, consequently, the geographical meridian is confounded with the magnetic. Starting from M A, let us inscribe the angle, α, and from N B the angle, β. Let us draw two straight lines forming such angles. They will meet each other at a point, χ, which is the exact position of the point sought.

As may be seen from this brief description, the compass field glass is destined to render great services. The apparatus, which is very ingenious and based upon the simplest principles, permits of fixing, by measurements sufficiently precise for practice, the vague and uncertain results that up to the present have been furnished only by observations left to the appreciation of each person.—La Nature.

*The "grade" is the division adopted in the army. The circumference is divided into 400 grades.

THE ROMAN BRIDGE OF MOSTAR.

The border lands of civilization are nearly always interesting, and Herzegovina is no exception to the rule. This province of Europe forms a part of Bosnia and is surrounded by Dalmatia, Croatia, Bosnia, Servia and Montenegro. The chief town of Herzegovina is Mostar, the meaning of this word being "old bridge." When Sir Gardner Wilkinson visited Mostar shortly before the publication of his work on Dalmatia and Montenegro, in 1848, the difficulties which were thrown in his way were almost insurmountable · but now Mos-



THE ANCIENT ROMAN BRIDGE AT MOSTAR.

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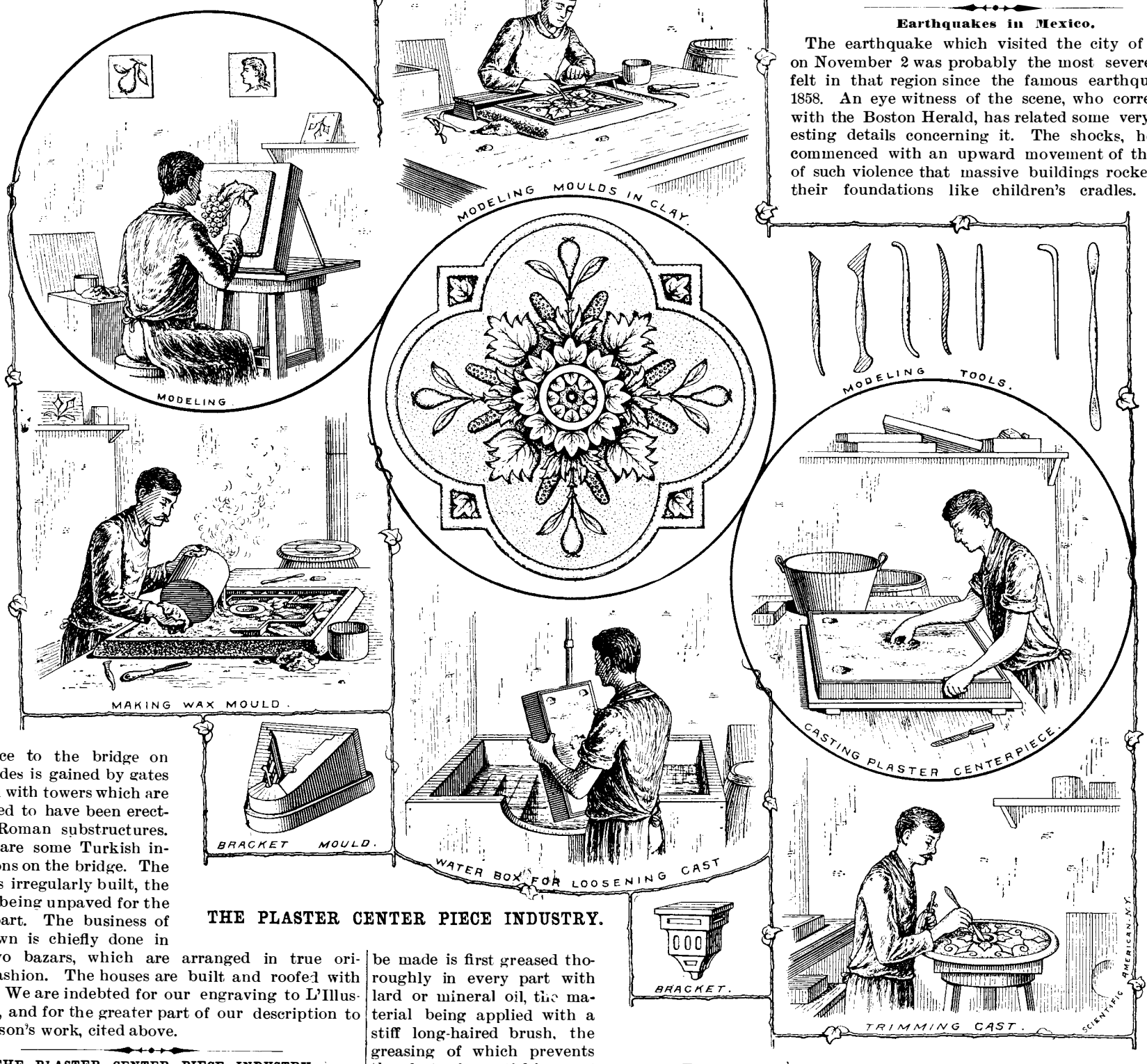
tar is a station on the Bosnia State Railway, and has 11,000 inhabitants, who are of many nationalities, Herzegovina having passed from Turkish rule to Austrian military occupation in 1878.

Mostar is situated on the Narenta, a brawling stream, thirty-five miles from its mouth. The banks are high and rocky, and are connected by a beautiful bridge, for which Mostar has always been celebrated and which forms the subject of our illustration. It is a single arch, the span being 95¼ feet, and at low water the parapet is 76 feet above the water and at high water it is sometimes only 44¾ feet from the water's surface. The breadth of the arch is 14·2 feet, the roadway 13·2 feet. On the north side is a stone conduit for conveying water to the eastern portion of the city. The bridge rises about ten feet in the center, giving an effect of lightness which was evidently not intended in the original designs. The building of the bridge is attributed to Trajan or Hadrian, about A. D. 120, but the Turks have carefully concealed the Roman masonry with small stones, which give the bridge the appearance of a Turkish construction. Both the inherent grandeur of the arch and tradition favor the belief that it was constructed by the Romans. Entrance to the bridge on both sides is gained by gates flanked with towers which are supposed to have been erected on Roman substructures. There are some Turkish inscriptions on the bridge. The town is irregularly built, the streets being unpaved for the most part. The business of the town is chiefly done in the two bazars, which are arranged in true oriental fashion. The houses are built and roofed with stone. We are indebted for our engraving to L'Illustration, and for the greater part of our description to Wilkinson's work, cited above.



THE PLASTER CENTER PIECE INDUSTRY.

THE PLASTER CENTER PIECE INDUSTRY.

The center pieces, brackets, and moulding used in the decoration of ceilings in public buildings, dwellings, etc., are made principally of plaster of Paris. A model is first made of clay, from which a mould consisting of resin and beeswax is formed, into which the plaster of Paris center piece is cast. The first process is the modeling of the design in clay from a sketch or drawing. This is done by spreading out a quantity of finely tempered and plastic clay on a hard wood or marble-covered table, the design, if a floral or fruit piece, being modeled into shape by the fingers and by the use of a number of wood, ivory, bone and steel tools, the modeler using them for finishing off neatly and sharply the parts which cannot be reached by the fingers. The best workman is one who can do most toward producing the required forms with his fingers unassisted by artificial tools, as a greater degree of ease and freedom almost always results from the use of the hands alone. While the modeling is in progress the operator keeps the clay moist and plastic by adding water to it. A damp cloth placed over the design or model keeps it moist when not worked. In modeling bass-reliefs the operator applies the clay to a slab of slate or a metal-covered block, which can be raised and lowered at will. Some models are made of soft wood shaped out by the usual chisels, gouges, etc. The clay model when completed is allowed to become hard. A coating of shellac is then applied and the sides built up with a quantity of soft clay. A solution composed of melted beeswax and resin is then poured over the mould, the casting of which forms the wax mould from which the plaster of Paris cast is made. About 5 pounds of beeswax to about 7 pounds of resin are required to form a 12 pound mould, it taking about half an hour to harden. The moulds when cast are about 2 inches in height and ranging from ½ inch to 1 inch in thickness. The wax mould when a plaster cast is to be made is first greased thoroughly in every part with lard or mineral oil, the material being applied with a stiff long-haired brush, the greasing of which prevents the plaster from sticking to the mould. The dry plaster of Paris is first mixed with water by hand in a tin vessel. To form a center piece about 2 feet in diameter, the operator mixes from 5 to 6 pounds of plaster in about 3 quarts of water to the consistency of cream, an expert being capable, during the process of mixing by his hand, of judging when the solution is ready by the sense of feeling. The material is then poured from the vessel into the mould, which is placed on a raised wooden frame, the center of which is cut out. The center of the mould, which projects below the bottom where the gas pipe passes through, rests over the opening, causing the mould to set evenly on the frame. After the plaster of Paris has been in the mould a few moments, the operator takes a portion of the plaster out of the cast where it is likely to be thick and heavy and spreads it over the thinner parts. The edges are then fastened and the material smoothed over by the operator passing a smooth wooden bar or stick over the surface. The cast is then allowed to harden, which takes about half an hour. The next operation is the taking of the cast from the mould. This is performed by submerging the mould into a water box for a few moments, the cast coming in contact with the water causing the plaster to shrink and raise slightly. The mould is taken out as soon as the cast raises, and turned bottom up. The sides and bottom of the mould, which is elastic, are then pressed in and out by the fingers, the operation causing the cast to loosen and drop out. Before the cast is dry the back is scored with a knife, which causes it to hold when plastered to the ceiling. The cast is then trimmed and the center hole cut through with a gouge. Lukewarm water in winter and cold water in summer is required for loosening the casts from the moulds, the wax being very sensitive to heat and cold. The cost of the wax used in making the moulds ranges in price from 30 cents to 38 cents per pound, and the resin from 3 cents to 4 cents per pound. A single operator can make a cast about 2 feet in diameter in about one hour. Plaster of Paris center pieces run from about 1 foot in diameter upward and are sold to the trade at from 50 cents to $2 each, according to the design. The sketches were taken from the works of Charles Mattern & Son, Jersey City, N. J.

Earthquakes in Mexico.

The earthquake which visited the city of Mexico on November 2 was probably the most severe shock felt in that region since the famous earthquakes of 1858. An eye witness of the scene, who corresponds with the Boston Herald, has related some very interesting details concerning it. The shocks, he says, commenced with an upward movement of the earth of such violence that massive buildings rocked upon their foundations like children's cradles. Many roofs were completely wrecked and large cracks were made in walls of solid masonry. The cathedral also sustained serious injuries. During the most violent part of the earthquake the pictures on the walls swayed to and fro, and telegraph cables swung in the air like clothes lines. The horses on the streets were unable to keep on their feet, and water was hurled out of the public fountain basins. The rocking was accompanied by loud, rumbling sounds which added to the terror of the people. The actual loss of life has been fixed at fifteen lives, and long lists of casualties are reported. The earthquake was also accompanied by the eruption of the volcano Colima, which continued long after the shocks had subsided to emit clouds of steam. There is a theory that on both coasts of Mexico there are submarine volcanoes which are active during seismic phenomena on the land. The scientists of the region visited by the earthquake assert that the shocks had no connection with the great disturbances of the earth's crust in South America.

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Electrical Effects on Wool.

Wool, says the Manufacturers' Review, after it is shorn and cleansed preparatory to the carding and spinning processes, is capable of being highly charged with electricity, and the phenomena resulting from this characteristic are familiar to all carders. Oftentimes the influence of this agent is so active as to interfere materially with the working of the wool.

Wool that is thoroughly wet, or that is well lubricated, either artificially or with its own natural grease, shows no effects from the presence of electricity, and it may be accepted as a well established fact that in all grades of wool the susceptibility to the influence of electricity increases in the ratio of dryness or absence of lubricating material in the fiber, or, in other words, to its freedom from the moistening effect of oil or water.

Sufficient moisture properly applied will not only prevent all of the ill effects of electricity in wool, but will destroy every evidence of its existence in both the picker and card rooms.

By making the feed light in bulk, speeding the feed roll and doffers faster for a quick feed and quick delivery, and reducing the speed of the main cylinders, tumblers, fancies, and the vibratory motions of the condenser, all of which results in diminishing the friction, the electrical effects are also done away with, either entirely or to such an extent that no injury results.

It is in a warm, damp atmosphere that the work of the card room is always at its best, if the stock is liable to electrical effects.

Thawing Frozen Meat.

A large portion of the supply of beef to the London market is furnished in a frozen condition, brought from great distances. A process for accomplishing the thawing of the frozen meat has been invented by Messrs. Nelson Brothers, who have an experimental chamber working at Lambeth. The chamber is provided with double doors, one of which is extremely thick, so as to shut out as far as possible all external atmosphere. The chamber has no windows, but is supplied with electric light. On entering one sees only some thirty quarters of beef hanging in rows on hooks, over a slightly raised open platform, with a canvas curtain at the back. Under this platform, however, there is a series of steam pipes, while behind the curtain there is a series of pipes filled with compressed ammonia, similar to those used in connection with the ordinary freezing processes. The steam pipes under the meat causes a current of warm air to ascend all round it, and as soon as this current reaches the top of this chamber it is drawn to the freezing pipes behind the curtain, by which all moisture is frozen out of it on to the pipes themselves. It accumulates there in the form of snow, which at the time of the visit of our representative was three-quarters of an inch in thickness. The snow has to be scraped off the pipes from time to time, and it is stated that the accumulation during five days, in the thawing of thirty quarters of beef, has resulted in no fewer than 168 pounds of water. During that same period the meat itself lost only one per cent in weight.

The purpose of the canvas curtain is, of course, to divide the ascending warm current from the descending cold current, and it is claimed that the effect of this incessant passing of the air first over the steam pipes and then over the freezing pipes is eventually to free it from all moisture, and so produce that "warm, dry air" which has been aimed at all along. When the meat is first hung the temperature of the room is almost at freezing point, but the steam is turned on gradually, until on the fifth day the temperature of the chamber has been raised to that of the air outside. By that time, it is claimed, the frost has all been thawed out of the meat, which is then in a condition to be sent to market for, if need be, immediate consumption.

Navy Yard Improvements.

A number of important improvements are about to be added to the Brooklyn Navy Yard at an expense of $500,000, and bids for the work have been asked for. There is to be a new concrete quay wall, 460 feet long, at the foot of Main Street, and a similar one 316 feet long is to be built along the Whitney Basin. A causeway 522 feet in length will also extend from the northeast boundary of the reservation to the cob dock across Wallabout Channel. Its walls will measure 1,045 feet, and the work must be completed by November 1, 1895. The causeway is to be 41 feet wide at the top, with a 20 foot driveway. Of the building improvements, the boiler shop is to be enlarged to twice its present dimensions. A new plate bending shop, 200 by 85 feet, to cost $70,000, will be placed near the stone dry dock to supplant the temporary wooden sheds now standing there. Probably the most important change, however, will be the modern three-story office building, which is to replace building No. 6. A large part of the money used in this work has been obtained from the sale of navy yard lands to the city of Brooklyn for market purposes.

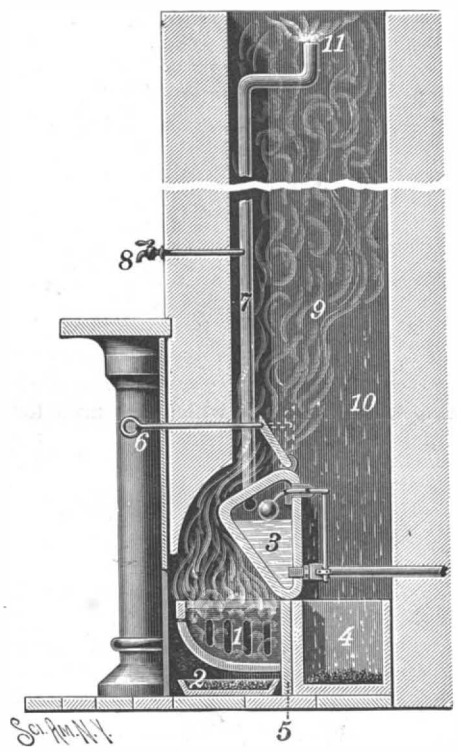
Correspondence.

THE EUREKA SMOKE BLEACHER.

To the Editor of the SCIENTIFIC AMERICAN:

In continuation of the subject matter of the illustrated article given in the SCIENTIFIC AMERICAN of October 27, I would add the following:

The theory or fact of dust in our atmosphere being the means by which light coming from the sun is reflected, and if there were no dust in the air we should be in continual darkness, and that the vapor in the air condenses on the dust and is precipitated to the earth in drops of rain, and that no rain drop forms and falls without having a particle of dust as the nucleus, seems to have a verification in the action of the Eureka smoke bleacher, for while the combustion in the furnace is perfect, nothing is visible as coming from the chimney, the steam which pours into the chimney four feet from the top, at a temperature of 212° F., is immediately met by the gases from the furnace at a temperature of not less than 360° F., and the vapor is absorbed by the air. If a bushel of coal is put in the furnace, a change immediately takes place, inky drops of water heavily charged with carbon are precipitated to the bottom of the chimney, while at the same time steam is visible coming from the chimney, and on the roof falls a shower of sparkling drops of water, which retain their form for a while and glisten in the shining sun. Place your finger on one of these drops that has fallen on a clean board, draw a line, and a black streak will follow the finger, thus showing that a particle of carbon formed the nucleus of each drop, which being lighter laden than those which fell to the



THE EUREKA SMOKE BLEACHER.

bottom of the chimney, floats a short distance away, but finally falls.

In round numbers, 99 per cent of the carbon entering into what is called dense black smoke is either consumed or precipitated to the bottom of the chimney. This no municipal corporation can possibly object to. The manner in which this percentage was obtained is as follows:

After carefully watching the chimney for over a month, several persons, who acted independently of each other, compared notes after the test had been made, and came to the conclusion that out of ten working hours per day the aggregate time when smoke was visible, varying at intervals of one-fourth to five minutes each, and varying in color from scarcely perceptible to 80 per cent of dense black, was one hour, and the color would not aggregate over 10 per cent of dense black, so that the amount of smoke escaping the chimney was 1 per cent, leaving 99 per cent to be either consumed in the furnace or precipitated to the bottom of the chimney, while much of the 1 per cent that escapes into the air is precipitated on the roof. Ninety per cent of the time perfect combustion takes place, as evidenced by no smoke coming from the chimney, and daylight in the carbon box so bright that a newspaper can be read. The nitrogen in the chimney probably absorbs and conveys the light from the top to the bottom, with the startling effect of its being much brighter than open daylight. When carbon enters the chimney the light disappears, an investigation of which is quite interesting. The drops are formed in the chimney where the steam strikes the carbon first; the heaviest loaded fall down the chimney apparently through the gases, the balance of the drops are thrown out of the chimney like spray from a fountain, the heavier drops curling gracefully over the sides of the chimney a few inches from the top and falling close to the chimney on the roof, while the lighter go higher in the air, some as high as ten feet, and fall a distance from the stack, really a beautiful sight to look at. The roof for ten feet around the chimney is very black, shading gradually another ten feet, where the roof is comparatively clean. In drops newly fallen on a piece of clean tin, particles of carbon, the nucleus of the drop, are seen floating around. The engineer's white jacket, on which fell a shower of these drops, absorbed the water and left the little black carbon spots to stand out in bold relief.

The old soldier's tale of rain always falling after a battle is no doubt true; the moisture in the air probably condensed on the particles of carbon in the powder smoke forming rain drops.

There is no oxidation of the iron lining of the chimney. It is perfectly dry and smooth. The only moisture in the chimney is these little inky drops of rain. Each drop seems to have an individuality of its own and to be about two-thirds carbon in moist and cold weather and nine-tenths carbon in hot, dry weather. The temperature six feet below the top of the chimney stood 360°, at steam pipe 285°, at top 205°, in carbon box 95°, the atmosphere 70°. It seems an absurdity to say steam at 212° will condense in a temperature of 360°; but when the law governing the formation of rain drops is considered, this does not seem so difficult.

Each raindrop seems to have an individuality of its own; millions of them fall side by side, never interfering; they fall at times through an atmosphere of 80 to 90 per cent density without being affected in the least. Whether they gather any additional dust particles in their fall is at present unknown; but it is possible, as the inky drops of water formed by the bleacher seem to gather carbon in their descent, and the principle of the bleacher is the principle of the making of a raindrop. It would be interesting to know just how high a temperature the principle would stand.

The device is easily adapted to stoves, ranges, and grates by means of a steam-producing hot water back, and pipe within the chimney to near the top. The grate would require a carbon pit in the rear of the hot water back, with drawer at bottom, as shown in the accompanying illustration.

1, grate; 2, ash pan; 3, steam-making hot water back, with or without automatic feedwater; 4, carbon box; 5, carbon drawer, easily withdrawn after removing grate; 6, damper; 7, steam pipe; 8, tap in steam pipe to moisten air in the room, valuable to hospitals; 9, gases going up chimney; 10, carbon being precipitated; 11, point at which vapor condenses on carbon particles.

It should be remembered that the dark-colored matter called carbon or soot is more than one-half metal, which cannot be consumed. It is absurd for city ordinances to say it can. Fines will not effect it; the ingenuity of man is wasted in attempting it. What then can be done to rid the atmosphere of this disagreeable matter? The only solution is to stop it from entering the atmosphere after it leaves the furnace; this is done by the bleacher.

JAMES T. SANDS.

St. Louis, Mo., 320 Roe Building, December, 1894.

Good Advice for Electric Car Builders.

An average of four or five cases of cars taking fire from electrical causes are reported to us every month, says the Street Railway Review. To this should be added three or four cases more of employes and passengers getting shocks from parts of the car which ought never to be alive. While we have never heard of a serious accident from this cause, there must be something radically wrong with the general run of car wiring which admits of so many cases of this kind coming to public notice. Car wiring is often not as carefully done as 50 volt incandescent light wiring, although it must stand ten times the voltage. Setting fire to cars and treating passengers to free shocks is not conducive to inducing traffic among the timid members of the community, and the money spent in repairs of cars that have been set on fire might be better spent in better wiring in the first place. In this connection it is a good plan when overhauling or building cars to see that all metal work within passengers' reach is permanently and positively grounded by a connection with the truck frame.

The Fox and the Eagle.

At Rondout, N. Y., recently, Samuel Jones set a trap for a fox at the upper end of the old Frazier clearing, in Seabury Settlement, and when he went to see if he had caught anything he found the trap was gone, notwithstanding it had been secured by a chain and a heavy staple driven into a log alongside.

The chain had been broken, and there was a rather plain trail in the dead leaves.

This trail Jones followed until he got to a small opening, about a dozen rods away, where on the moss lay his fox, dead, yet holding fast by the throat a dead eagle.

The eagle, in flying over the woods, had seen the entrapped fox and had swooped down upon it, but the fox, although crippled by the trap, had made a good fight, and had killed his assailant while yielding up his own life.

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STEEL FOUNDATIONS OF TALL OFFICE BUILDINGS.

(Continued from first page.)

its place. On the same inner end is established another column, which in the completed building supports such a share of the weight as to take the strain from the anchorage. It seems a daring conception to base the wall of a 300 foot building upon an end of a plate girder overhanging as this one does, yet precisely this method of construction is adopted in many buildings, and is recognized as one of the best ways of solving the problem of their construction.

The American Surety building rests on thirty-two of these steel columns. Two of them bear a weight of 584 tons each; one of the columns on the north side carries 1280 tons; these are the extremes of weights carried; the other twenty-nine columns sustain various loads intermediate between these. There are two cantilever columns, and they support respectively 746 and 663 tons. The columns support all of the building except these lower two stories.

Our other cut shows a building termed the Fahys Building, now erecting in this city, by Messrs. Clinton & Russell, architects, in which a type of foundation is adopted which has been used to a considerable extent in Chicago. Over the entire area of the building, after a sufficient depth is reached, is placed a layer of concrete. Over this concrete 20 inch I beams weighing 64 pounds to the foot, and extending across the lot, are laid, twelve inches between centers, and are completely bedded in cement. On the platform thus established longitudinal plate girders 4 feet deep are placed, on which rest the columns, twenty-six in number, for carrying the superstructure. The load carried by a single column varies from 172 to 357 tons, the building being 150 feet high.

This is an example of the shallow type of foundation, but one which has been found to answer admirably, even where the soil is of soft consistence. In this city there is a temptation to use deep foundations in many places where the solid rock can be reached. In a soil like that of Chicago, however, there is little advantage in this, and the present example shows the application of this platform type of foundation in New York. The ground at Chicago is such that the buildings settle a little, and the extent of this settling is so well understood that in erecting a building it is allowed for, and it is only when the building reaches its approximate size that the lower story sinks to its final and predetermined level.

As regards the wind bracing of these buildings, this is provided for by the general rigidity of the frame and by bracket plates introduced where the columns and horizontal members intersect. It has not been found necessary to use diagonal tension members. In special cases, such as the dome of the Manhattan Life Insurance Building, however, a very elaborate system of wind bracing may be employed, but for the main structure the frame gives ample strength.

Athletics as a Mental Training.

In England we are apt to take the necessity for sports in some form for granted, but in America the subject of athletics is discussed with a seriousness which hardly obtains in this country. Dr. Conant, of Boston, in a very suggestive article in the Boston Medical and Surgical Journal, pleads earnestly for the general acceptance of athletics, not as a mere sport or pastime, but as part of the system of education which the universities supply. There can be no question that while the "sitstill system" of education has done much harm to children, free muscular activity has been conducive to brain development, partly, probably, by supplying it with more healthy blood, but partly, also, by the cerebral activity involved, the muscle and the nerve being, in fact, but two parts of one machine.

Much as one might imagine that carefully planned gymnasium exercises could be arranged to give the exercise required, the gymnasium does not seem a popular place; nor does Dr. Conant seem to think much of it as a means of education. As usually arranged it is under cover, and so lacks that great essential—fresh air; and it lacks the stimulating influence of outdoor sports, and especially of games. Nevertheless, gymnastics, although not the most useful form of exercise, are of great advantage as a training for a crew or team. If, however, says Dr. Conant, there is to be any attempt at regular and systematic development, not only of the body, but of the mental faculties as well, one must have, in order to get the highest good from such training, a certain amount of stimulus in the work to be done, the stimulus arising from competition and from public appreciation.

Speaking of football, he says that there is a considerable risk of injury in the game, especially to men who have not been carefully trained in the sport at school. What is wanted is some constant and careful supervision over the players, so that they shall be in a condition both of physical and mental health. A list which is given of the injuries received by the Harvard men during the last four seasons shows a considerable number of accidents, but comparatively few of a serious nature, and those appear to have occurred chiefly among the "class" rather than the "'Varsity" teams, showing that the better-trained men are far the least liable to injury. There seems no doubt that rowing is one of the best means of developing a man in an all-round way; but both in regard to it and "track" athletics much of the benefit arises from the individual training or "coaching" given to each man.

We come round, then, to the old point that athletics should be looked on as part of the education of that inseparable neuro-muscular arrangement of which man is principally made up, and to the activity of which all expression of either intellect or emotion is due. In considering the further bearing of this question, the influence which an athletic training has upon a man after he has left college must not be lost sight of. Many a man feels that his success in after life is largely due to the excellent condition of his mind and body brought about by the athletics which he practiced when in college.

This athletic training never entirely leaves him in after life, and although he may be much occupied in other ways, he still finds opportunity for indulging in some form of athletic work which keeps him physically a healthy man and mentally a bright one.—British Med. Jour.

Some Experience with Mosquitoes.*

BY HOWARD EVARTS WEED, AGRICULTURAL COLLEGE, MISS.

While it has been known for some time that a small amount of kerosene placed upon water containing the larvæ of the mosquito will kill the larvæ and thus to some extent lessen the number of mosquitoes in a locality, it was not until Mr. Howard gave his experience with the remedy that we realized how easy it was to rid a locality of the mosquito pest. In the French quarter of New Orleans it has been a common practice for many years to place kerosene in the water tanks to lessen the number of mosquitoes in that locality; but I know of nothing that has been written showing that such is the case, and in this age of advancement we can no longer go by hearsay evidence. Everything must be founded upon known facts, and these facts can only be ascertained by experiment. Thinking that some experience with the kerosene remedy for mosquitoes which I have had this season might be of interest, I wish to state the following as corroborative of what Mr. Howard has shown in regard to the simplicity of the remedy.

On the college campus are eleven large water tanks, two of which are used for drinking water and the others for irrigation and fire protection. Not far from the limits of the campus are also four pools of standing water, three of which are used for watering stock and the other for irrigation in the horticultural department. These pools, however, are well stocked with fish, and as I have never found any mosquito larvæ in the pools, I am under the impression that the fish keep the pools clear of them.

Before the water tanks were built the college campus had been quite free from mosquitoes, but the evil has been constantly upon the increase, reaching its climax early the present season. I have often advised that a small amount of kerosene be placed in each of the water tanks, and the college proctor several times informed me that he "had a nigger put kerosene in the tanks every week, but it did no good." The college physician also stated that he had placed some kerosene in a jar of water containing some of the wiggletails, but that the kerosene had not killed them, thus regarding the remedy recommended as ineffective.

By the 20th of June of the present year mosquitoes had become so numerous on the college campus as to make life a burden, and sleeping without a mosquito bar was out of the question. Wishing to demonstrate the effectiveness of the remedy which I had recommended, I took a large glass jar and filled it nearly full with water from one of the tanks, which was fairly alive with the mosquito larvæ. The jar contained several hundred of the larvæ and I took it to the college physician, poured a little kerosene in the jar, and asked him to please watch the effect. This was as expected, for within fifteen minutes all the larvæ were dead. Upon visiting the various tanks I found that four of them contained the mosquito larvæ in very large numbers, as I had expected to find. The other tanks, with one exception, are within closed buildings in which the mosquitoes are not apt to breed, as they are situated in dark garrets and used for fire protection. The exception noted was a tank used for general household purposes, and the gentleman owning it assured me that he placed a cup of kerosene in the tank every Monday morning. June 26, I placed in each tank a gallon of kerosene, with the result that ten days later the mosquitoes had almost entirely disappeared from the campus, and we were able to sleep without mosquito bars. The amount of kerosene used was much more than would have been necessary, and I am sure the same work would have been accomplished had only five of the tanks been treated, these being the only ones that are outdoors and not protected much. All the outdoor tanks are covered, but there are many cracks where the mosquitoes can get in and out. An examination of the tanks has been made about once a week since the kerosene was put on, and on July 18 more kerosene was put in two of the tanks. Upon all the outdoor tanks a thin film of kerosene has remained since the kerosene was put in. The campus is now nearly free from mosquitoes, and has been so since ten days after the kerosene treatment. Hereafter during the summer kerosene will be put in the outdoor tanks, putting in enough to keep a thin film over the top of the water.

I have also found that kerosene is also a good article to use to prevent mosquitoes from annoying one when the mosquitoes are numerous. To use it for this purpose a little is smeared on the back of the hands and also upon the face. At first thought this would seem to be a disagreeable operation, but a trial of it will prove that it is not disagreeable in the least. It is quite effective in keeping the mosquitoes away and is much better than the Florida method, which I have been told is to remain secreted under a large iron kettle and with a hammer clinch the bills of the mosquitoes as they are thrust through the kettle.

*Read at the Brooklyn (1894) Meeting of the Association of Economic Entomologists.—From Insect Life.

Aerated Bread.

In 1859 Dr. Dauglish, an Edinburgh physician, devised a process of bread making which did away with the use of yeast and its consequent evils of fermentation and deterioration. Aerated bread is made from dough that has been raised by the mechanical introduction of carbon dioxide. Dr. Dauglish's process consisted in using water charged with CO_2 in place of yeast, and for mixing the flour and water by a mechanical contrivance instead of by hand. The aerated bread is said to be more nutritious and more digestible than the ordinary yeast bread. It can be made in one and a half hours, while it requires from four to five hours to form the sponge of yeast bread alone, not including the time necessary for kneading, raising and baking.

There is, therefore, a considerable saving of time and labor, and the aerated bread might be sold at a very low figure. Its manufacture, however, would be economical only when it is made in great quantities, since the plant for manufacture is costly. Aerated bread bakeries have been established at various times in New York, Chicago, and Philadelphia, but none have proved popular, and it is probable that at the present time not a loaf of aerated bread can be bought in America. In England, however, aerated bread has been popular for twenty years. There are at present eighty-three stores selling it in London alone, employing over 1,000 operatives. The stores have an average of from 250,000 to 300,000 customers a week, or about 15,000,000 customers a year.

Electricity as Bait.

The Prince of Monaco has invented a fish trap which is said to have proved highly successful. In the first place he has provided a trap net which can be sunk to a depth of two miles, and this is furnished with an electric light and plunge battery, protected against the pressure of the water by large air cushions. When the trap has been sunk into position, the current is turned on, and the light from the lamp attracting the fishes, these are caught in large numbers, many of them being such as have not been previously seen. The apparatus consists of a small incandescent lamp of three candle power, having a piece of wire twisted around it to keep it from shaking against the quart bottle in which it is placed, the bottle being weighted to insure its sinking to any depth required. Attached to the lamp and passing through the stopper are two light weight electric wires, which run out to any length desired, the depth of the lamp in the water being regulated by a large float board.

A Ship Pierced by a Swordfish.

A curious account of the injury sustained by a vessel from the thrust of swordfish has recently been reported by the captain of the Norwegian bark Lorenzo. The sword or projecting bone of the fish passed through the metal sheathing of the hull, through 6 inches of planking and 3 inches of inside ceiling. The sword was found firmly wedged into the hole it had made, and when extracted with some difficulty, it was found to be 20 inches in length and of an oval shape. The larger end measured 5 inches in diameter and the sharp point 2½ inches in circumference. The water made a passage for itself at the side of the sword, and it was found necessary to work the pumps at intervals of six hours to keep the vessel afloat.

Lactola.

This relates to the improvement of skim milk, whereby its deficiency in fat is restored. One hundred gallons of the milk with 50 to 200 pounds of white sugar are boiled in a vacuum pan to one-third or even one-fourth of its bulk. The mixture is transferred to another pan, and 1½ to 2 ounces of refined cottonseed oil are added, and the whole stirred until thoroughly blended. This artificial milk is termed "lactola." The admixture of coffee, cocoa, tea, or extract of meat with "lactola" is also claimed.

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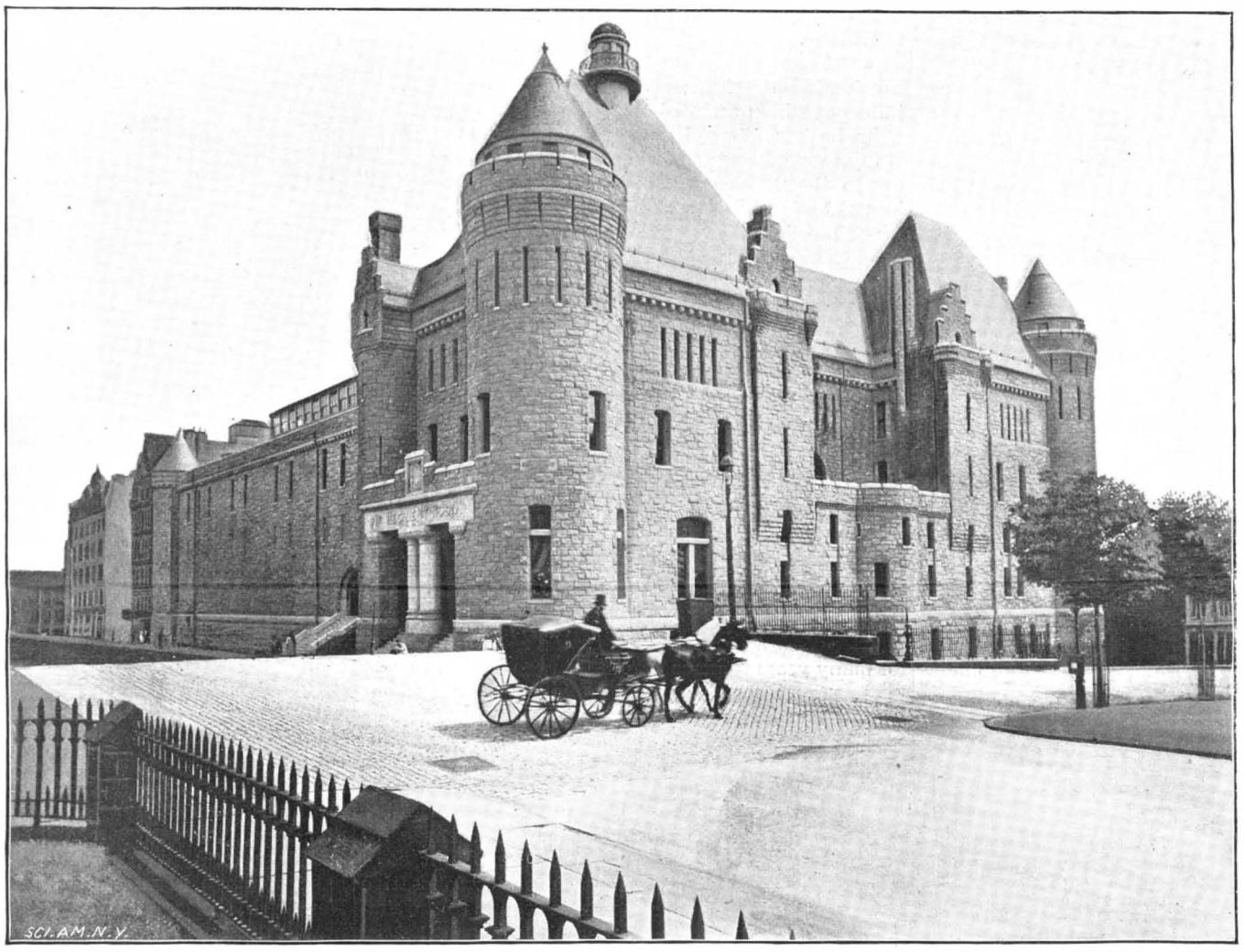
THE NEW ARMORY OF THE SEVENTY-FIRST REGIMENT, NEW YORK CITY.

The people of New York take great pride in their military organizations. The National Guard of the State of New York has about 5,200 officers and enlisted men in the city of New York. In the last few years the State has made liberal grants for building armories. One of the largest and finest of these is the new armory of the Seventy-first Regiment, situated on Park Avenue and occupying all of the western end of the block which is bounded by 33d and 34th Streets. It is one of the choicest locations in the city. We give two photographic illustrations, one of which is a general perspective view and the other the massive doorway near the corner tower.

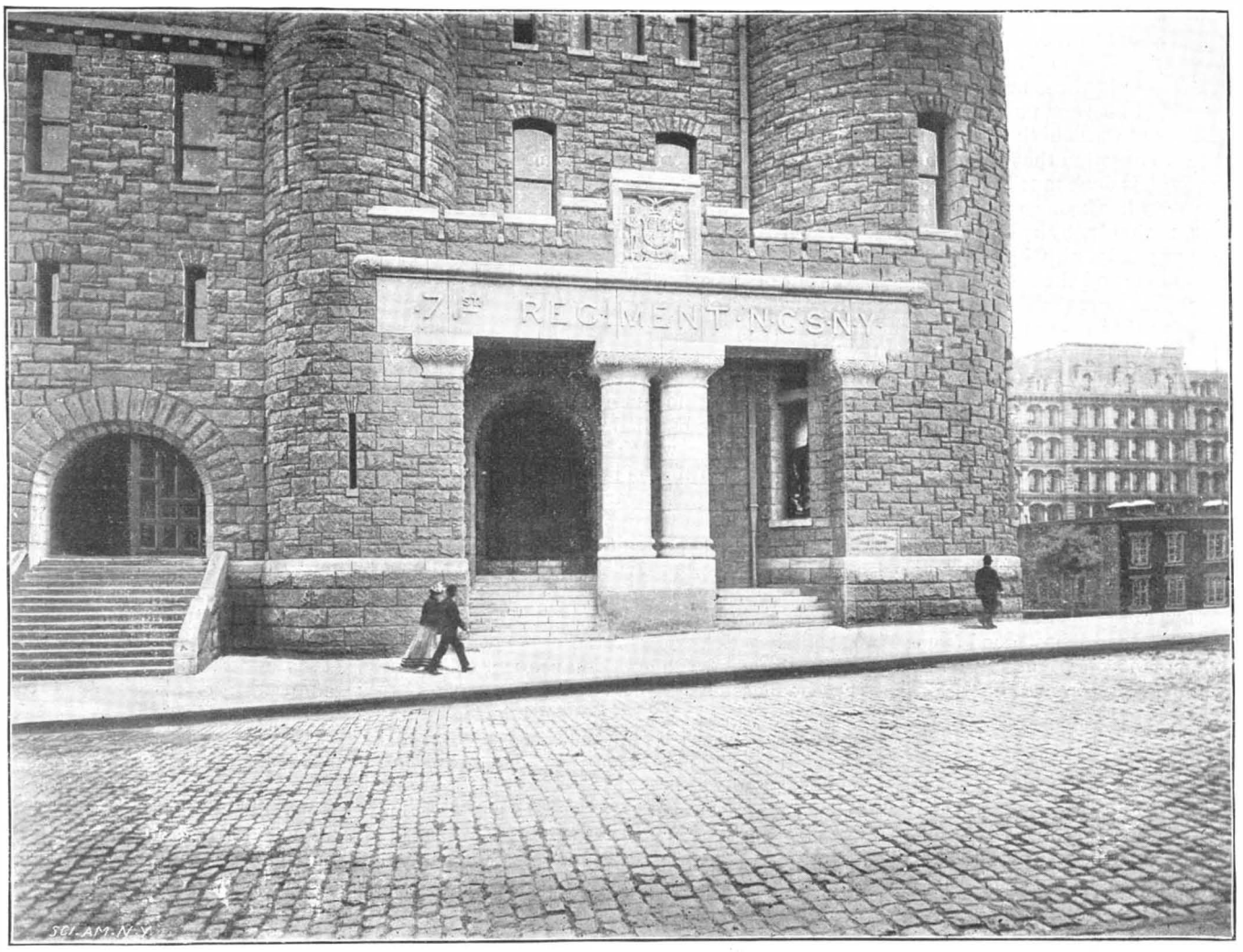
The edifice is built of light stone, the style a modified French Gothic. The crenellated towers afford an excellent position for marksmen in case the armory should be attacked. The first floor is occupied by the great drill room, the library, and officers' rooms. On the second floor are the company rooms, which are appropriately decorated. The interior of the armory and its appointment are admirably adapted for their intended use. The armory has just been finished. The architect was J. R. Thomas, of New York, and the contractor Patrick Gallagher.



THE NEW ARMORY, SEVENTY-FIRST REGIMENT, NEW YORK CITY.

Interesting Ruins of Cliff Dwellers.

The ruins of a very interesting city of cliff dwellers have recently been discovered among the Bradshaw Mountains of Arizona. It is situated high up on the terraced banks of Willow Canyon, and is estimated to comprise 260 buildings, in a fair state of preservation. Like most of the cities of these strange people it stands in an almost inaccessible position. A series of narrow steps cut in the rock in the side of the canyon probably provided means of ascent and descent. Only a few of the buildings have been explored and these were found to contain large quantities of pottery. The most interesting discovery, however, was of a number of crude agriculturalinstruments. This is the first proof of any value that the cliff dwellers cultivated the soil. The canyon in front of the ruins of the city is one-half a mile in width and gives evidence of having been cultivated at some remote period. A man's skeleton, 4 feet 8 inches in length, was also discovered. An exploring party is being fitted out to make a thorough investigation of the ruins.



DOORWAY, ARMORY OF THE SEVENTY-FIRST REGIMENT, NEW YORK.

Phosphoreted Hydrogen.

A new and extremely simple mode of preparing phosphoreted hydrogen is described by Prof. Retgers in the current Zeitschrift fur Anorganische Chemie. After reviewing the usual mode of preparing the gas for demonstration purposes, by heating yellow phosphorus in an aqueous solution of potassium hydrate, and the other more rarely employed methods of preparation—such as by the interaction of calcium phosphide and hydrochloric acid, copper phosphide and potassium cyanide and phosphonium iodide and water—the question of the direct combination of hydrogen and phosphorus is discussed. It appears that the currently accepted idea that ordinary molecular hydrogen does not combine with phosphorus is founded upon some old experiments of the French chemists Fourcroy and Vauquelin, who state that when phosphorus is melted in hydrogen gas, vapor of phosphorus becomes diffused in the hydrogen, and confers upon it the power of ignition in contact with oxygen without any combination between the phosphorus and hydrogen occurring. In view of the great readiness which, as Prof. Retgers has recently shown, warm hydrogen exhibits to unite with free arsenic, it was considered possible that the reason for the non-combination of hydrogen and melted phosphorus might be found in the low melting point (44°) of the latter. Experiments were therefore made with red phosphorus, which, of course, is capable of being raised to a much higher temperature.

When dry hydrogen is led through a glass tube containing red phosphorus and afterward through a wash bottle containing water, practically pure hydrogen is found to escape. Immediately, however, a gas flame is brought under the part of the tube containing the phosphorus, combination occurs, and the gas issuing from the wash bottle at once inflames in the air. The non-spontaneously inflammable gaseous hydride of phosphorus is also therefore accompanied by a smaller quantity of the spontaneously inflammable liquid hydride, and a sufficient quantity of the latter for demonstration may be isolated by leading the vapors through a U tube immersed in a freezing mixture. Moreover, the solid hydride is likewise produced as a yellow deposit near the heated portion of the tube. Upon removing the flame from beneath the tube, the bubbles of escaping gas cease to take fire as they emerge into the air, and are found to consist of almost pure hydrogen.

The production of phosphoreted hydrogen is consequently entirely dependent upon the elevation of the temperature considerably above the melting point of ordinary yellow phosphorus. The new mode of preparation is recommended by Prof. Retgers as being more convenient and elegant than the old-established method of boiling phosphorus in caustic potash, as forming an excellent example of the direct combination of two elements and as furnishing ample demonstration of all three hydrides of phosphorus, the gaseous, liquid and solid.—Nature.

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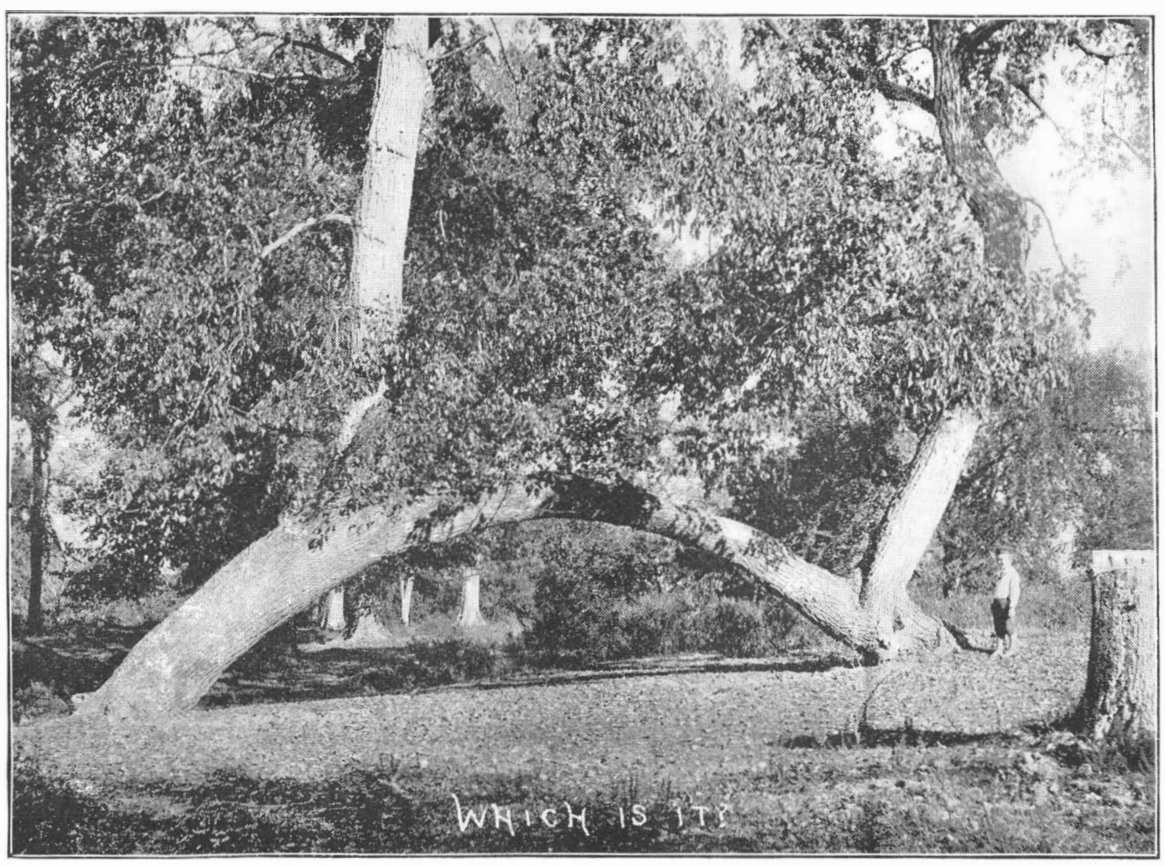
The Monkey in the Man.

To see the monkey in the man you have only to study the faces, bodies, and habits of babies. Such is the theme of a very interesting article contributed by Mr. S. S. Buckman to the new number of the Nineteenth Century. The actions of children are, indeed, he says, like "ancient monuments of prehistoric times. The human infant is an interesting object of scientific research, and even a cross baby should be calmly contemplated by the philosophic mind." The Westminster Gazette subjoins a dozen of the numerous illustrations which Mr. Buckman gives to show how survivals of our simian ancestry may be found by any nursery philosopher:

1. Monkeys are snub-nosed (simian). So are babies.
2. Babies have pouch-like cheeks. To judge from ecclesiastical monuments, this characteristic is supposed to be specially angelic. It is really monkey-like. Baby cheeks are the vestiges of cheek pouches, possessed for storing away food, as in Cercopithecus, a monkey in which this habit of storing may be observed at the Zoological Gardens, if visitors feed it.
3. At the base of the vertebral column babies have a deep circular depression. This is the mark of the monkey's tail.
4. Babies (as Dr. Louis Robinson has shown) have superior arm power and very short legs. So have monkeys.
5. Babies in catching hold of anything don't use their thumbs, but clasp it between the fingers and palm. This is the action of monkeys in going from bough to bough.
6. A baby can move any of its toes independently, and it can move them one from another so as to make a V between any of them. As it grows older it loses this power and also the power of turning its ankle; but that it has such power over its muscles when young points to ancestors who used their feet more than their hands as organs for picking up small objects; and who relied on their arms and hands for supporting their bodies.
7. Babies go to sleep on their stomachs with their limbs curled up under them—a survival from our four-footed ancestors.
8. Babies are rocked to sleep—an imitation of the swaying to and fro of the branches where our monkey ancestors lived. Even our nursery ditties ("Lullaby baby on the tree top") point back to the arboreal ages.
9. The stair-climbing instinct of babies (like the tree-climbing propensity of boys) show:
10. The fruit-stealing instinct is a survival from monkeydom.
11. Children are fond of picking at anything loose—because monkeys pick off the bark from trees in order to search for insects.
12. Children are very fond of rolling. This points to the time when our ancestors had hairy bodies tenanted by parasites, and allayed the irritation by rolling.

A DOUBLE ELM TREE.

We are indebted to Mr. R. D. Wirt, superintendent of the Independence (Mo.) Water Works Company, for the following: You will find in this photograph a peculiar freak of nature. The tree is an ordinary elm, and can be seen in a good healthy state of growth on the farm of Captain L. P. Williamson, two miles north of Independence, Mo. The trunk at each end of the bow is some 20 inches in diameter, and it is a very difficult matter to tell which is the original root. Hence our amateur artist, P. H. Grinter, has imprinted on the photograph the question "Which is it?"



A DOUBLE ELM TREE.

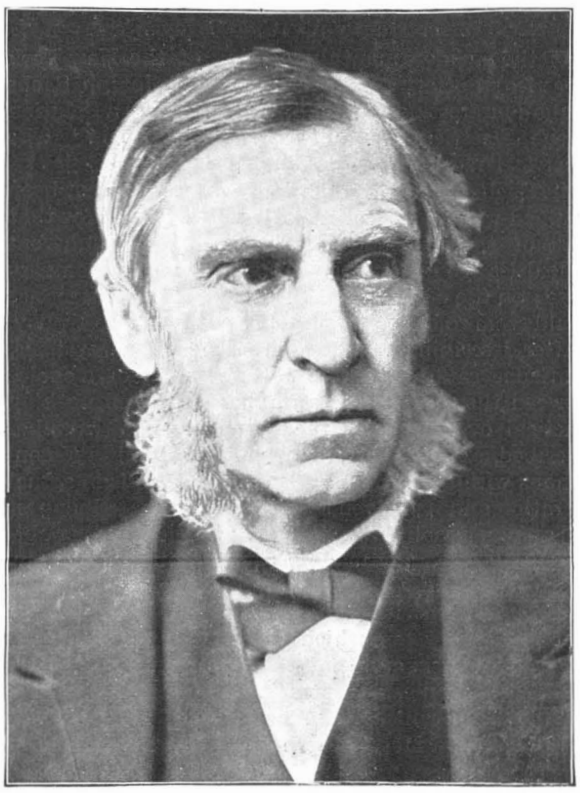
The Dead Sea of America.

The dead sea of America or Medical Lake, as it is called, because of its medicinal qualities, is situated on the great Columbian plateau in Southern Washington. It measures a mile in length and from a half to three-quarters of a mile in width and has a maximum depth of 60 feet. It stands at an altitude of 2,300 feet above the level of the sea. The chemical composition of this lake is nearly identical with that of the Dead Sea of Palestine, and like its eastern counterpart, it is almost devoid of life and no plant has yet been found growing near its edges.

DEATH OF JAMES ANTHONY FROUDE.

The famous historian, religious essayist, and biographer, James A. Froude, died on October 20, at the age of seventy-six years.

"The death of Mr. Froude," says the New York Evening Post, "ends a life which, in its interests, its emotions, and its activities, in more ways than one reflects the strange transition through which England has been passing during this century. He was one of the very few survivors of that extraordinary group of



JAMES ANTHONY FROUDE.

young men who, over fifty years ago at Oxford, illustrated in the sphere of religion the power of the all-pervading spell of the romantic spirit in its revolt against the rationalism, the common sense, and the placid self-content of the eighteenth century, which found their shapes in the utilitarian Liberalism of the day."

Mr. Froude was the son of Archdeacon R. H. Froude. His education was obtained at Westminster and at Oriel College, Oxford, where he was graduated in 1840. He took his master's degree, and in 1842 he carried off the English prize with an essay on "The Influence of the Science of Political Economy on the Moral and Social Welfare of the Nation." He became a fellow of Exeter College in the same year, and two years later he was ordained a deacon in the Established Church of England. He had no taste for clerical duties, however, and he devoted himself to literary work. He fell under the influence of Newman, then an English Churchman, subsequently a cardinal in the Roman Catholic Church, and wrote "The Lives of the English Saints." In 1848, when but thirty years of age, he published the book which created such a sensation, "The Nemesis of Faith." In that work he proclaimed himself a rationalistic doubter. His attack on Bibliolatry and his theory of religion brought upon him the censure of the University authorities and the loss of his fellowship. He was very successful, however, as a magazine essayist, and one of his essays, on the Book of Job, was reprinted in separate form. Two years later Mr. Froude published the first two volumes of his "History of England," and the book, although sharply criticised, received great popular indorsement. The succeeding volumes of the work were issued from time to time until the conclusion in 1870. In 1869 he was installed rector of the University of St. Andrew's, the degree of LL D. being then conferred on him. In 1872 he resigned his diaconate in the English Church under the Clerical Disabilities Act.

Nothing excited more comment in Mr. Froude's career than his work as Carlyle's literary executor and his personal and professional hostility toward the historian Freeman. With regard to these matters, the New York Tribune says:

"Much of the blame was due to Carlyle, whose indecision had grown upon him with his years, and who, in addition to the clause in his will placing his papers at Froude's disposal, seems also verbally to have put them in the possession of his niece, Mrs. Alexander Carlyle, who had long been an inmate of his family. The 'Reminiscences' realized nearly £2,000, and Froude gave Mrs. Carlyle about £1,600, but the censure on the editing, partly due to Froude's haste and partly to the fact that he made revision impossible by turning over the papers in his possession too quickly to Mrs. Carlyle, led the latter to endeavor by legal means to prevent the publication of Froude's own work. The matter was quieted at law, but criticism was busy with it for more than half a decade.

"When Lord Salisbury appointed him as the successor of Freeman at Oxford, the friends of the latter manifested a feeling of bitter annoyance. Freeman himself in his lifetime had sharply criticised Froude's method as a historian, to some extent justly. But it came to be pretty well understood that no reflection was intended in the choice of the new professor upon the memory of the one who had passed away. Nevertheless, Froude's inaugural address, though studiously elaborate, sounded now and then a note of defiance. For example, he spoke of Freeman as one 'who along with his asperities had strong masculine sense,' and said of his critics: 'Being omniscient already, I conclude they did not feel that they had more to learn. Like St. Paul, I may say, I labored more abundantly than they all. Like St. Paul, I say also, I speak as a fool.'"

Mr. Froude's conception of the historical method was formulated in a lecture on the science of history, delivered at the Royal Institution in 1864. "It often seems to me," he said, "as if history was like a child's box of letters, with which we can spell any word we please. We have only to pick out such letters as we want, arrange them as we like, and say nothing about those which do not suit our purpose." Critics have described him as a special pleader, but it is the general verdict to-day that he has been indispensable and has, by his unconventional methods, restored equilibrium in many cases where views as one-sided as his own had usurped the authority of history.—Literary Digest.

Good Maxims from the Keystone.

A well known banker says he owes his success to observing the good advice of an older friend, who told him to keep good company or none. Never be idle. Cultivate your mind. Make few promises. Live up to your engagements. Keep your own secrets When you speak to a person, look him in the face. If any one speaks ill of you, let your life be so that no one will believe him. Live within your income. Small and steady gains bring the kind of riches that do not take wings and fly away. Earn money before you spend it. Never run into debt unless you see a sure way to get out of it. Never borrow if you can possibly avoid it. Do not marry until you are able to support a wife. Never speak evil of any one. Be just before you are generous. Save when you are young and enjoy your savings when you are old.

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The Influence of Occupation on Eyesight.

An interesting paper was read by Mr. Simeon Snell at the recent meeting of the British Medical Association at Bristol, on the "Relations of Some Occupations to Eyesight." Mr. Snell, as ophthalmic surgeon to the General Infirmary, Sheffield, has had unusual opportunities of seeing and treating affections of this kind, and his observations are of a highly practical nature. He refers in the first instance to the effects of bisulphide of carbon, which was the subject of an inquiry made in 1885 by a committee appointed by the Ophthalmological Society. This heavy, transparent, ill-smelling fluid is used as a solvent of sulphur chloride, and is the agent effecting the "vulcanization" of India rubber. The process by which the rubber is impregnated with the sulphur chloride is termed "curing," and during this process heavy fumes of the bisulphide are given off. The vapor was much employed some years ago as a powerful irritant of the conjunctiva, causing abundant lachrymation, by which it was thought nebulæ of the cornea left after ulcers could be washed away or cleared up.

Mr. Snell states he has seen one case of amblyopia which he considers was due to this agent, since the affection supervened after exposure to its influence and disappeared when the man was engaged in another part of the works. Another chemical agent exercising a deleterious action on the eye and on the health generally is dinitro-benzol. This substance is used in the manufacture of explosives, and the patients affected were chiefly those engaged in mixing or grinding the material. It induces amblyopia or dullness of vision, and on inquiry no less than five cases were discovered. The toxic influence of tobacco when chewed may now be regarded as a well established fact, but Mr. Snell endeavored to ascertain whether Galezowski's statement that visual disturbances occurred in those engaged in the manufacture of tobacco as a consequence of the inhalation of nicotine powder was correct.

His observations are, however, opposed to this view, and he quotes the opinions of Mr. Shears, who visited a large tobacco factory where 1,200 men and women are employed; of Mr. C. Lee, who made similar observations at a large factory at Chester; and of Dr. Dowling, who examined some of the operatives in a factory where 3,000 hands were employed, all of whom were opposed to the statement made by Galezowski. In particular Dr. Dowling found that those who did not smoke were uniformly free from troubles of vision of a toxic nature, and that the females were almost universally free from the trouble. The cases recorded by Mr. Priestley Smith and Valude show that iodoform must be added to the agents causing toxic amblyopia; but inquiries made for Mr. Snell in iodoform manufactories are to the effect that no cases have been observed of impairment of vision attributable to the manufacture of this substance. The prejudicial action of lead has long been known, but Mr. Snell mentions a hitherto unsuspected mode in which the toxic influence of this metal may be produced.

Saturnine amblyopia occurs, it appears, among the file cutters of Sheffield, and this is due to the circumstance that the file is placed on a lead bed, and each time it is struck with the chisel sufficient of the lead is raised to cause by its inhalation the symptoms of toxic amblyopia. It may, however, reasonably be suggested that the lead is introduced by the contact of the hands with it and its ingestion with food. But the most interesting part of Mr. Snell's paper is that where he discusses the influence of intense light and excessive heat. His own observations do not support the statements made by others that glassblowers are frequently the subjects of cataract. We agree with Mr. Snell. When Salviati's shop was in work at Olympia we made some inquiries to ascertain whether there was any truth in the statement that the workmen commonly lost their vision at the age of forty, but two of the men working there were themselves long past that age and were not aware of any cases of blindness induced by the glare of the furnace in their fellow workmen.

Mr. Snell has ascertained that there is a very marked difference in the way a temperature is borne when it is below 2,000° Fah., and when above that heat. Up to that degree a man can look at the metal in a furnace with comparative ease, but before it reaches 3,000° he is compelled to wear colored glasses. Now in cast iron furnaces the heat of the metal is from 1,800° to 2,000° and the men take no precautions; but the heat of molten steel is from 2,700° to 2,800°, while the heat of the gases in the furnace would be about 200° or 300° more, and the men in attendance have to wear dark blue glasses to protect their eyes. The heat of the metal in the Bessemer process is higher still, increasing to 3,000° or 3,200°, but the metal has not to be so long or so carefully watched as in the Siemens furnace. In none of these cases, however, has Mr. Snell been able to associate any deep or superficial eye lesion as a result of the exposure of the eye to intense light and heat.

There is still another source of light which has been found to exert a prejudicial influence on the eye—namely, electricity; exposure to the light employed in electric welding—and supposed to be equal to 8,000 candles—causes sharp conjunctivitis, with great pain and lachrymation, and, if it be allowed to enter the eye, optic neuritis, with retinitis and a central scotoma in the vision, is extremely likely to occur. The effects are due to the chemical rays, which are most intense toward the violet end of the spectrum, and the men are obliged to use a screen made of dark ruby, non-actinic glass. These, with many other details, are interestingly given in Mr. Snell's paper.—The Lancet.

Electric Conduit Railways.

At the regular monthly meeting of the New York Electrical Society on November 1, Mr. Joseph Sachs read an interesting paper entitled "Is there a Solution of the Electrical Conduit Railway Problem?" The Electrical World gives the following report:

Mr. Sachs gives as reasons why success has not been attained with electrical conduit railways thus far that most of the projects were immature, the inherent difficulties are great and the cost of construction very large; on the other hand, he thinks the maintenance would seem to be less expensive than with the trolley.

After describing a large number of conduit systems, Mr. Sachs said that there was not much of a choice between them, as there had apparently been nothing practical evolved from the extremely large number described, except the plain open slot conduit and continuous wire system. This is the one that is in actual operation and has given satisfaction both at Budapest and at Blackpool, England, but he considered it doubtful whether it can be made practicable in this country, where the climatic and local conditions are different.

Mr. Sachs gives it as his opinion that we will never get a conduit system which can be put in for $20,000 a mile, single track, and that it may be as high as $30,000 or $40,000 per mile, single track.

The system which is to be installed upon Lenox Avenue by the Metropolitan Traction Company was then described.

The ordinary conduit yoke will be employed, and at the manholes, 30 feet apart, the insulators, which are of rectangular form and of soapstone, will be located, and supported in cups embedded in sulphur. At the top of the insulators is fastened an arm of iron. To this arm is fastened a contact conductor of channel iron. The contact shoe comes down to the slot and has two arms which press outwardly from the single supporting bar which rests on the rails, making a continuous rubbing contact. There being two conductors used, there is no structural return.

The insulators are located in the manholes and are easily accessible. They are quite a distance apart and the voltage is low, it being intended to use about 250 or 300 volts. The conductors are very nearly directly under the slot, which was apparently the objection in some of the first systems, but the peculiar construction and location of the insulators in this system may prevent any trouble from this source.

An extended discussion followed the reading of the paper. Mr. C. B. Fairchild thought that it was a question whether there is any extraordinary demand for an underground electric system, and he quoted from an authority who stated that "a successful underground system would be a great calamity for the street railway interests of this country, from the fact that if one were adopted every little city throughout the country would demand that all the wires be put underground, and it would ruin nine-tenths of the street railways of this country if they were compelled to operate under such a system." He described the underground system which is now being placed in Washington, D. C. The yoke is about the same as has been used in Washington on the cable construction, a little heavier, perhaps, and the conduit is about 25 inches deep and 18 inches wide; the conductor is a four-inch channel iron, four inches deep, and supported from the top instead of the bottom, as will be the case in New York City, and headed with trunnion bands to provide for expansion. The cost is estimated to be more than the cost of cable construction, and Mr. Fairchild states that the Siemens-Halske Company, who proposed at one time to put in an underground system, admitted to him that the cost would be more than the ordinary estimates for cable construction. In New York City, the cable roads were built for not less than $150,000 per mile, single track; but in Washington the cost is about $30,000 per mile, of single track; ordinarily, however, the cost would be from $60,000 to $75,000 per mile with single track.

The difficulty of contraction and expansion in conduit conductors was referred to, and Mr. Fairchild stated that in Washington, where the temperature in the conduit varied from below freezing to 140 degrees, a great deal of difficulty had been experienced in this connection. Mr. Fairchild fears that there will be difficulty in the Washington system through using a porcelain insulator, as he thinks it will require a material less hygroscopic, such as mica or something of that kind. He referred to the extreme dampness of conduits and thought that an economical street railway cannot run with a 300 volt current, at least 500 volts being required. A heavier construction will also be required to support electric cars than required for cable cars, on account of the motors, and the cost will be correspondingly great.

Electric traction is very much harder on the rails than cable traction where the headway is under three minutes. Even where the rail is from 75 to 80 pounds, the cost of maintaining the track where electric cars are used is surprisingly great. In answer to a question as to the comparative cost of the cable and electric roads, Mr. Fairchild stated that the cars in both cases would cost about the same, but that the motor would cost from ten to twelve times as much as the grips, or a difference of about $1,000 per car.

Mr. R. R. Lundell stated in regard to the Johnson-Lundell system which is now being tried at 59th Street, that the storage battery used is a very small one, but it carries the car through emergencies and will bring it back to the station in case of a breakdown. Through its use expensive electric conduit construction is done away with, also complications such as switches and cross-overs. Mr. Lundell gives as reasons for the adoption of this system that in New York City the open slot, owing to the size of the conduit, would necessarily be very expensive. The Johnson-Lundell system, he said, could consequently be installed much cheaper. The electro-magnetic device was adopted, as the electromagnet has shown itself to be positive. He stated that they are now ready to put down the system at $30,000 per car mile double track for the electrical equipment without rails or ties, and Mr. Sachs added that the track would cost about $20,000 a mile additional. The battery weighs only 1,500 pounds and takes care of itself; it is always sealed up and charged continuously. The voltage is 300.

Mr. Field stated that in the case of one road which he put down, the cost of the trolley system was as high as $75,000 per mile for a single track, which included $20,000 per mile for paving the streets from curb to curb. He stated that the Badapest system, as modified in America, would fill all the requirements of American conditions. He said that the conduit which is going to be put in in New York City is a modification of the Siemens-Halske conduit.

Mr. E. A. Merrill described the three-wire system, with which, he said, there was difficulty in balancing. At Bangor, Me., in going up steep hills, very frequently they would have to take the trolley off one side and put it on the other wire. The same difficulty in balancing was found in Milwaukee. He stated that he knew of one road where the cause of the difficulty was not discovered, but the road was abandoned. He referred to the much greater investment in copper at 300 volts, which would be four times greater than at 600 volts, and said that it was not a very large road that puts in an investment of $100,000 to $150,000 in copper, so that at a reduced voltage it can be seen what the difference would amount to.

Mr. Fairchild questioned a statement to the effect that electric and cable roads in certain conditions were operated at about the same cost per car mile, as he had found that cable roads as a general thing, under the same conditions, are cheaper than electric roads.

Enlargement of New York City.

The question of the enlargement of the area of New York City was submitted to the popular vote of the inhabitants interested at the recent November election, and the project was indorsed by a small majority. If satisfactory terms can be arranged, it is probable the consolidation will be effected.

The area and population of each of the cities and towns which it is proposed to consolidate are as follows:

Place.	Area in square miles.	Population.
New York City	38·85	1,801,739
Brooklyn	28·99	957,958
Flatbush	5·69	12,625
Flatlands	12·79	4,234
Gravesend	10·96	8,418
New Utrecht	7·96	9,129
Richmond County	57·19	53,452
West Chester	15·50	10,029
Part of the town of East Chester	1·91	4,612
Part of the town of Pelham	2·83	3.541
Flushing	29·65	19,803
Part of the town of Hempstead	17·86	17,756
Jamaica	33·50	14,441
Long Island City	7·14	30,506
Newtown	21·32	17,549
Jamaica Bay	25·63	—
Total	317·77	2,965,792

Artificial Limbs.

We do not advise any one to have a leg cut off for the mere luxury of enjoying the use of an artificial limb; but if disease or accident renders the mechanical substitute a necessity, then we strongly recommend the invention of A. A. Marks, 701 Broadway, New York. A committee of the Franklin Institute investigated the subject of artificial limbs a few months ago and reached an official conclusion that the Marks patented invention was one of superior excellence, and from a humanitarian point of view quite important; in which opinion we fully coincide.

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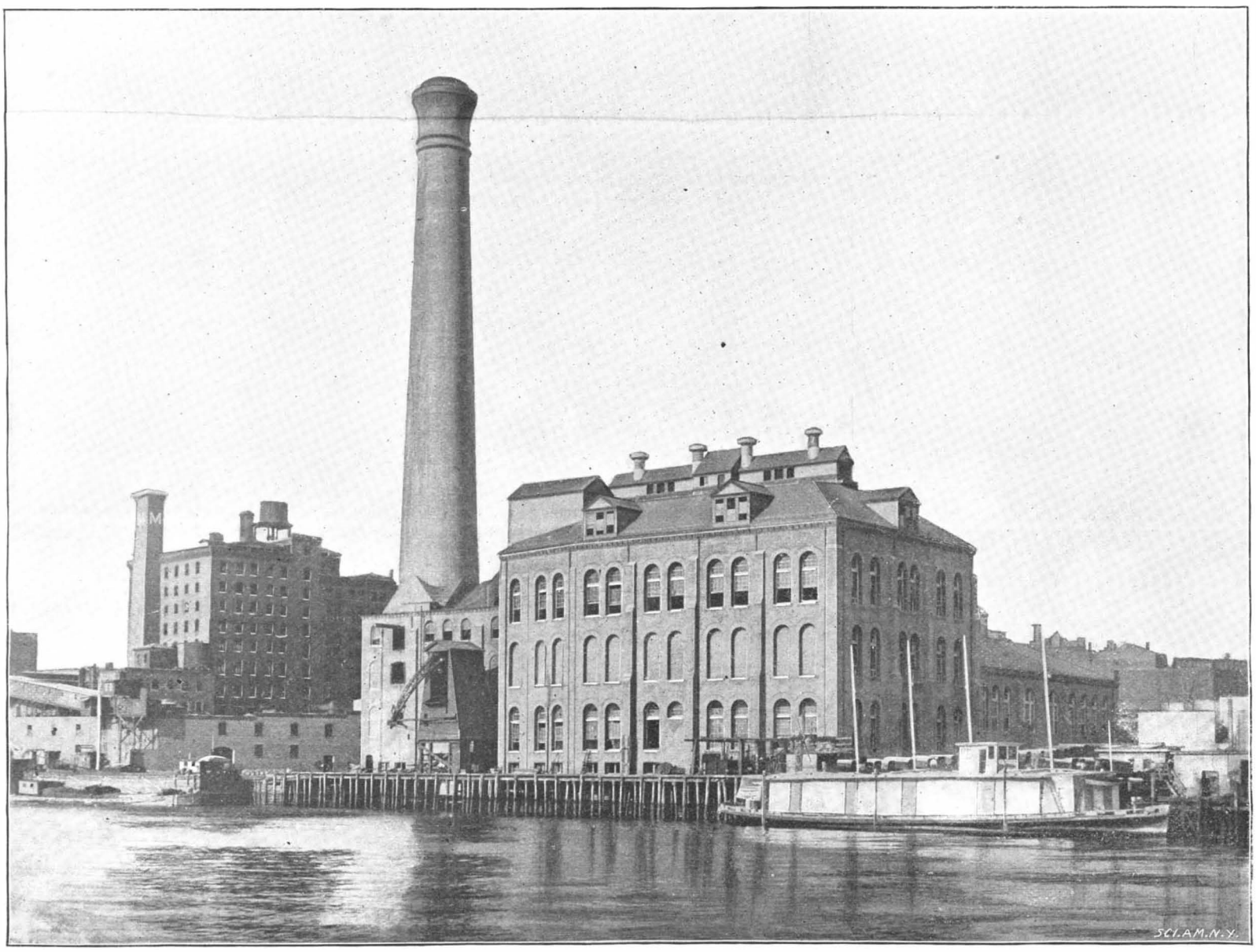
THE EASTERN POWER STATION OF THE BROOKLYN CITY RAILROAD COMPANY.

The Eastern Power Station of the Brooklyn City Railroad Company, situated on the banks of the East River, in Brooklyn, N. Y., from the electrical and mechanical aspect is undoubtedly one of the most perfect steam and electric plants in existence. Throughout the entire structure every detail is applied to secure perfection of working and an accurate record of results. The dynamos and steam engines have been already described by us in our issue of September 8, 1894. We now illustrate the building proper, with its great chimney, designed to supply natural draught for the thirty-six Babcock & Wilcox tubular boilers eventually to be introduced. The chimney is of brick and rises to a height of 296 feet, and contains a circular shaft 17 feet in diameter. It is not only available for natural draught. Into its base a species of nozzle or intake is built, to which are connected two 12 foot Sturtevant blowers. When these are in operation, a torrent of air is injected in the base of the chimney and acts injector-fashion to produce a draught. The advantages of this system are that it dispenses with the necessity for closed ash pans or boiler room.

Our view shows how remarkable a feature in the scenery this chimney is, and although situated in the vicinity of the many-storied sugar refineries of the eastern district of Brooklyn, themselves remarkable for height, it dwarfs them all. Within the building of this station are large coal pockets, situated immediately under the roof, with a capacity for holding 6,000 tons, and near the base of the chimney is seen the coal-hoisting plant. Like other electric power and light stations in this vicinity, the general cycle of operation includes the receiving of coal into roof pockets, its delivery thence by gravity to the boilers, and the removal of ashes from the lower floor. The coal and ashes being weighed and the water evaporated measured, and other accurate records of the process being kept, the entire operations of the station may be interpreted as an analysis on a gigantic scale for determining the efficiency of the processes and the quality of the fuel.



THE EASTERN POWER STATION OF THE BROOKLYN CITY RAILROAD COMPANY.

Experiments in Military Signaling.

The Army and Navy Journal says: The Signal Corps of the army is being highly complimented upon the work it has done in perfecting military signaling, particularly by means of telegraph lines. Important experiments were made with the bimetallic wire. It was laid on wet earth and grass, and conversation was carried on without the least difficulty, the tone of the voice and the volume of sound both being very good. Several hundred yards were added and the wire wound around an iron support buried in damp ground. The voice was easily distinguished, with little or no diminution in the volume of sound. The wire was then wrapped about a piece of brightly polished metal and buried in the damp earth directly in front of the receiver. This even did not affect the volume or tone of the sound received from the distant operator. With these "grounds" in the wire, the line itself, 20 feet in front of the receiver, was buried 3 or 4 inches in the ground. Still the tone and volume of the voice were unaffected, or, if at all, so slightly as to be inappreciable to the ear. Later a mile of the wire was laid on the damp grass and with the same good results as before.

Immersion of the wire in a lake, however, completely cut off the conversation. An iron feed pipe to the lake and the wire itself were thoroughly scraped to a clear and bright surface and the wire then wrapped tightly six or seven times around the pipe—this after a mile of the wire had been run out. Through this mile of wire lying on the ground and grass, and through this seemingly perfect "ground" by the water pipe, the voice came as distinctly and of as great a volume as ever. Again, after a night of very heavy rain, a half mile of the wire was stamped into the ground, soggy with water—in fact, practically buried in half a mile of mud—without affecting the volume or distinctness of sound, and words whispered at one end of the line were heard at the other. In another experiment over 150 yards of silicon-bronze wire, of the same size as the bimetallic were laid on the wet grass and buried in six places between the two stations, but conversation in low tones was entirely feasible. The wire was cut and the two ends stuck in the ground, at first a few inches apart and eventually at a distance of 45 feet apart, and, incredible though it seems, a message sent from one station was received at the other. The sounds came very distinctly at shorter distances, and at 45 feet distinctly though faintly. At a greater distance than 45 feet the sounds were too faint to be read, while at any less distance little difficulty was experienced in reading a message.

At the request of General McCook, the military balloon now at Fort Riley will be moved the latter part of this month to Fort Logan, where it will be available for field practice with military maneuvers. The experiences of the past year prove that the utility of the captive balloon is not confined to the open country, but on occasions it may be of supreme importance in connection with operations in the great cities. Within the past year the troops of our own army, called upon to assist the civil authorities, found themselves marching miles of distance to repress riotous proceedings, while the body of men sought for had accomplished its end and was already moving undisturbed and unobserved to another objective point. Under such conditions the operation of a captive balloon provided with electric and telephonic connection with the commanding general offers an unequaled means of observing and instantly reporting the movements of the hostile rioters, who would thus be under the surveillance of the commanding general, enabling him to act with promptness and effect.

Some interesting experiments were recently made from a balloon in an attempt to discover the whereabouts of the ill-fated Russian warship Rusalka. Count Nicolas Orloff, in the "France Adrienne," says the balloon was towed from place to place by the transport Samoyede, which was specially fitted up to facilitate ascents. The rate at which the balloon could be towed varied from 2¼ knots, with a favorable wind, to 6¾ knots. Two observers, relieved every three hours, were constantly in the car. Count Orloff says that with the balloon at a height of 400 meters it is not possible to see the bottom of the sea at great depths in consequence of the impediments to vision offered by the color of the water and the bottom; that, with a favorable light, rock and sand are clearly defined at a depth from 6 to 7 meters (19½ to 23 feet). The view from the car extended to about 46½ miles. Colonel Orloff concludes that "captive balloons could be of great utility as observatories to a fleet and in reconnoitering the entrance of unknown harbors, in hydrographical researches, and also in reconnoitering the enemy's ships and ports, more especially as by their means the exact position of forts, batteries and the various coast defenses could readily be ascertained."

Photographic Reproduction of Chalk Drawings.

The observation made in this column, says the Graphic, with regard to the closeness with which chalk drawings could be copied in photography, received ample illustration in a case that I only heard of the other day. It seems a drawing made by a notable artist was obtained and carefully copied on exactly the right kind of paper by means of photography. The imitation was said to be so complete as to almost deceive the artist himself. A good many copies of the print were then obtained; they were all carefully mounted in imitation of the original drawing, and these were all pledged at pawnbrokers in different parts of London for various sums. The majority of them were sold, and the affair was only found out by the artist discovering it in the house of a friend, and pronouncing it to be a photograph.

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Accident to an English Express Train.

The Scotch express left Edinburgh as usual, and consisted of ten ordinary carriages, a Pullman car and two heavy engines. Running at the normal speed, nearly sixty miles per hour, the train approached Northallerton, in Yorkshire, on the Northeastern Railway, about 3 o'clock P. M., in the midst of a thick fog which covered the land, but left the atmosphere above clear. This probably prevented the drivers seeing the signals which were set against them, and the whistling of the goods engine gave the first intimation of danger. Almost immediately after the express plunged into the goods train. The impact was terrific. The front engine was turned over and thrown down the side of the slight embankment, which exists here, into a field adjoining, and the tender was swung completely around and rested end upward on the top of the engine. The second engine and tender fell over on its right side in the middle of the line, the tender being crushed into the footplate. The front portions of both engines were battered in, and one of them had its chimney and cupola knocked off. The guard's van was smashed almost to atoms, the woodwork being splintered, the axles snapped and various portions of the van and the luggage scattered about in all directions over the permanent way. The third-class carriage that followed shared a similar fate, the wheels being forced underneath the Pullman car, which was partly raised up by the force of the collision. The guard's van at the rear of the goods train was also smashed up. The Pullman car was damaged, but the main body of it was preserved intact. Six passengers were seriously injured, while the majority of the passengers received a severe shock. The driver of the first engine, Thomas Adamson, received fatal injuries, and the driver of the second engine was also seriously injured. Help was quickly at hand, and the injured received every attention, while work was at once begun to clear away the wreck.

The most noticeable feature of the wreck is the comparatively uninjured condition of the Pullman car. Although shifted from its normal position on the trucks, with the exception of the smashing in of the platforms, the car body suffered little and resisted the shock to a remarkable degree. "It is doubtless true," says the London Railway World, "that the weaker carriages before and behind the Pullman car acted in some measure, at least, as buffers; but it is evident that if the other cars had been built with something of the longitudinal stiffness of the Pullman, while the train might have been thrown off the track, there would have been no such complete smashing up of carriages as the photographs show. Our ordinary carriages with their comparatively weak sills and end construction serve quite well enough for regular service, but in case of collision they can offer slight resistance. With cars of longer and heavier build, the alignment of the train may be broken, and the cars may be thrown violently from the line and overturned, but the bodies are much more likely to remain intact and to offer the occupants an opportunity of escape than the match box structures which compose many of our express trains. The accident at Thirsk also demonstrated the advantages of the Pullman car in case of collision: and while accidents are happily of rare occurrence on English railways, it is a question that managers and superintendents of car departments might well consider, whether some changes cannot be made which will approximate in some degree the strength and stability of the Pullman car. In America, where, as a general rule, the ordinary carriage is much stronger than the corresponding carriage on an English railway, the companies feel the need of securing even stronger construction. The two examples which we have now had of the way in which the Pullman and the ordinary cars act in collision should serve as an incentive to devise means by which the effects of accidents may be minimized."

Patent Decision.

Where an invention had been reduced to practice in a positive form under a patent, and the applicant has simply filed his application, without doing anything to adapt and render the invention practical, and where he knew of the issue of the patent within a few days after its issue, and made no suggestion that the invention was his, but recommended it to purchasers, both orally and in writing, as the invention of the patentee, and where he did not assert any title to it until six months after the issue of the patent, and after he had left the employ of the company who owned the patent to do service for a rival company, the Court of Appeals of the District of Columbia held (Wells et al. vs. Reynolds et al.) that priority must be awarded to the patentee.

[The above decision is not only good law, but is sound common sense. From this decision inventors will see the danger of delay in the making of their applications, for the purpose of allowing another to get a patent, and after it is well introduced apply for a patent with a view of proving priority, thus derive the benefit of the first patentee's efforts in getting the invention introduced. This thing has been frequently done, but this decision should prove a deterrent.—EDS.]

The Water Power of Niagara.

Engineers have estimated, says Harper's Weekly, that the total water power of Niagara Falls is 7,000,000 horse power. This estimate, to be sure, is in the main only a guess, but when the area drained into the lakes above Lake Ontario, and passing through the Niagara River, be considered, the guess or estimate does not seem to be too large. The water surface of the great lakes above Ontario is 84,000 square miles, and the watershed of these lakes is 240,000 square miles—more than twice the area of Great Britain and Ireland. The total length of shore line is 5,000 miles, while the volume of water is 6,000 cubic miles, of which Lake Superior contains almost one-half. The rate of outflow at Buffalo is from 217,000 to 275,000 cubic feet per second, while the fall of the cataract is 165 feet. The volume of water in the lakes is such that it has been estimated that even if no rain fell, the flow of the river would be continued at its present rate for one hundred years—that is, if the lakes could be gradually drained. These are very large figures, but in the main they are the results of exact measurements.

The small water powers in the world are uneven, and are afflicted by floods and droughts, but this great power at Niagara is as constant as anything in this world can be, not even the ice in the severest and longest winter ever known appreciably changing it. The present plant is intended only to utilize 125,000 horse power, and the turbines now in place are only for a small part of this. Other turbine wheels will be put in place as the demand for power grows. The general plan of the company contemplates the ultimate use of 450,000 horse power on the American side and a like amount in Canada. Such a power would turn all the wheels within a radius of 500 miles of the falls. At the present time a considerable part of the power developed is to be taken to Buffalo by electric transmission, and it is the confident expectation of the electricians now at work on the problem that the power can be taken as far east as Albany, 300 miles away, and delivered there cheaper than power can be generated by burning coal. If this be so, then all the country between Albany and the falls will be admirably adapted for manufacturing, while the Erie Canal will afford cheap and tolerably quick transportation, for there seems to be little difficulty in the way of hauling these boats by electrical power.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

SWITCH MECHANISM.—Sumter B. Battey, New York City. A transversely sliding switch bar is connected with the switch rail, according to this invention, there being blocks held on the bar, and spring-supported rods fitted to slide on the car platform are adapted to engage the blocks to shift the bar laterally. The improvement is designed to afford a simple and durable mechanism, more especially fitted for use on street railroads, to enable the driver or motorman to set the switch at will, while the car is in motion, to change the direction of the car to a side track, or to set the switch rail back to the main track, if it had been previously left turned for the side track.

DUMPING CAR AND ATTACHMENTS.—Samuel W. Beatty, Bayou Goula, La. This inventor has devised a simple, strong and durable car peculiarly adapted for carrying and dumping sugar cane, but also applicable for other purposes, and in connection with the car is an easily controlled mechanism to effect the dumping. The bottom and sides of the car form a slatted flexible body, held together by links, and the body is adapted to be raised at one edge and swung upward and outward in dumping, the loaded car having been previously brought beneath hoisting and dumping apparatus.

Mining, Etc.

GRADING ORES OR SIMILAR MATERIALS.—Daniel Brennan, Jr., Bayonne, N. J. This inventor has devised a method of classifying ores comminuted so finely as to be difficult and expensive to classify by screens. The material is fed in a close falling stream into a chamber containing water or other fluid, and the force of gravity is utilized to separate the finer and lighter particles from the coarser and heavier ones. Near the bottom of the apparatus are vertical partitions forming a central and two side pockets, each with an outlet, and on top of each partition is a movable partition on a shaft, by which the partitions may be adjusted toward and from each other, such adjustment of the partitions regulating the fineness of the material falling in the outer pockets.

MIXING DEVICE IN ALLOYING.—William H. Howard, Pueblo, Col. The process of alloying the silver in molten argentiferous lead, with zinc, is facilitated, according to this invention, by a device for conveniently and thoroughly mixing the zinc with the molten lead, without danger of oxidizing and rendering the zinc inert. A cover having on its under side an annular flange is passed into the molten lead in the pot, and a stirring device on the under side of the cover passes into the lead. This device consists of a cylinder supported by brackets from the cover, and a propeller wheel in the cylinder is adapted to be rotated by a shaft, the stirring being thus performed mechanically in a confined chamber, instead of by hand, with ladles.

Electrical.

SECTION INSULATOR.—Albert Hennefeld, Christ. Dehner and Charles H. Van Ness, Colorado Springs, Col. This is a simple and effective trolley wire break, which may be inserted in the line at any time without interfering with traffic, and without the necessity of slackening the line. It consists of a curved bar of wood or other insulating material with metallic tips at its ends, and means for mechanically connecting the ends of the trolley wire and engaging the span wire, the insertion in the line being made without the use of solder, and without the necessity of slackening the line.

TELEPHONE MOUTHPIECE. — Rial N. Denison and Frank M. Geary, Brooklyn, N. Y. This mouthpiece is suitable for attachment to speaking tubes as well as telephones, and does not differ in appearance from the ordinary mouthpiece, but it is made with an outer and inner shell to form an intervening chamber, the inner shell being perforated and an antiseptic material located within the chamber, whereby the mouthpiece will be cleanly and in no manner a conductor of germs.

Mechanical.

POWER HAMMER.—James B. Sweeney and Robert W. Laird, St. Johnsbury, Vt. This hammer is adapted to deliver an elastic blow similar to that of a hand hammer, and has a vertically reciprocating hammer head actuated by a tilting helve, the hammer head and helve being connected by a built-up spring formed of contiguous parallel plates, so that by using more or less plates the spring may be more or less resilient. The invention provides a simple and easily operated means of driving and adjusting the helve to give a powerful blow and just the requisite stroke.

MACHINE AND METHOD OF FULLING CLOTH.—Henry Balbian, North Vassalborough, Me. This invention provides for uniformly fulling a number of separate pieces of cloth simultaneously by twisting them together and then fulling them in their twisted condition. In the fulling machine, in combination with the fulling rollers, is a revoluble carrier provided with guide holes for the passage of the pieces of cloth, and a guide rod located intermediate the fulling rollers and the carrier. Each piece is, by means of this improvement, designed to receive the same fulling as would be the case with the ordinary machine treating one piece.

WRENCH.—William N. Smith, Santa Cruz, Cal. This is a monkey or pipe wrench of very simple and durable construction, in which the lower jaw may be quickly and accurately adjusted to a pipe or nut, this being effected with one hand. The jaws are capable of very fine adjustment, and the tool is composed of but few parts, any portion being capable of ready replacement, should it become damaged or otherwise unfit for use.

Agricultural.

THRASHING MACHINE.—Riley Knight, Moscow, Idaho. This invention provides for locating an engine upon the thrasher, and a mechanism driven from the engine whereby driving power may be applied for thrashing or to propel the machine, the shifting being effected in a quick and simple manner. The machine also has a hoisting drum adapted for use in connection with the feeder of a derrick table which may be coupled to the thrasher, and both of them moved by the engine and connected driving gear. The engine may be removed when the thrasher is not needed, and used for other purposes.

LAND MARKER.—Henry Bowers, Milton, Wis. This device comprises a marker arm adapted for pivotal attachment to a planter, and with a regulating block at its pivoted end, and other novel features, whereby the driver, without stopping the team or leaving the seat, may elevate the marker as desired above the ground, or throw it from one side of the machine to the other. The device is especially adapted for use with corn planters, and is simple and easily operated.

FRAME FOR HAYSTACKS. — John P. Brown, Walcott, Ind. This frame comprises upper arched sections adapted to cover the top of the stack, square sections to cover its sides and ends, and quadrant sections to assist in closing the ends, each of the sections comprising an open frame provided with a netting, and means for detachably connecting the several sections with each other. The frame is inexpensive, durable, and readily applied to a stack or rick, preventing the stack from falling or being blown over by heavy winds, while any part of the frame may be readily removed to afford access to the straw.

Miscellaneous.

THAWING ICE FROM PIPES.—Isaiah H. Simpson, Brunswick, Me. This is an improvement on a formerly patented invention of the same inventor for an improved portable device, of very compact construction, for rapidly thawing ice formed in pipes. The invention consists principally of a revoluble boiler, through which circulates the water to be heated and forced into the thawing pipe.

SWING.—Samuel I. Alston, Galveston, Tex. This is an improvement in swings whose seats or seat supports are suspended from a pivoted rocker. The frame forming the support of the swing can be easily knocked down and packed in small space, or moved to where it is to be erected, indoors or in the open air, the swing being a neat, convenient, and perfectly safe one for the use of either children or adults.

PAPER FILE.—Joseph B. McEnally, Clearfield, Pa. This device comprises two clamping strips, one with two transverse slots and a laterally opening longitudinal slot, while the other strip has spaced holes conforming with the transverse slots. A binding wire is bent to produce two limbs that engage the spaced holes, pass through the transverse slot, and when folded enter the longitudinal slot. The device is most simple and inexpensive, and affords means for securely filing papers that are to be detachably bound in a volume.

HANGER FOR USE IN BUILDINGS.—Louis Lane, Newark, O. This hanger is for securely supporting the ends of joists in buildings, and is adapted to be readily secured to the header or supporting beam or wall. It is formed of sheet metal, and has a horizontal seat, from which extend vertical triangular wings, triangular flanges extending sidewise therefrom at right angles, and there being a bearing iron on which the triangular flanges are fastened. The blanks for the hanger may be cut out of sheet metal without waste.

PAPER BOX.—Edward E. Pinkerton, Sioux City, Ia. This is a folding or knock-down box, formed of a single blank of pasteboard or similar material, being quickly cut or stamped therefrom and readily creased and folded, and the individual parts securely locked in place.

TYPEWRITING MACHINE.—Walter F. Kasson, Boise City, Idaho. This is an improvement in typewriters, having a knee-lever attachment, whereby the carriage may be shifted from left to right without manual assistance. The platen is automatically turned at the end of each line to make the line space, or it may be turned by striking a finger piece of the platen key. The improved attachments are applicable to Remington machines, and, with slight modifications, to other machines.

ALARM CLOCK.—Theodore Biedinger and Thomas J. Kane, New York City. This is an improvement in clocks, having a setting spindle to spring out and stop the alarm, and which, when pushed in, permits the alarm to ring until the clock is run down. The attachment is very simple, costing comparatively nothing, and may be arranged so that one cannot stop the continued sounding of the alarm until the attachment is readjusted by hand for such purpose.

GARMENT SECURING DEVICE.—Otte Van Oostrum, Portland, Oregon. This is a device, convenient to adjust, for reliably retaining trousers, gloves, or shoes, in closed adjustment, but so that the fastening may be released by draft strain on a cord or other flexible connection attached to a series of similar fastening devices.

RAIN WATER CUT-OFF.—Jean M. Castaing and Jean B. Dohin, New Orleans, La. This is a device to be arranged between the conductor on a building and the cistern. It is so constructed that the first water running from the roof, carrying off the accumulations of dust, etc., will be discharged without running into the cistern, but after a certain amount of water has been thus allowed to flow away a valve will be automatically shifted so that the clean water will run to the cistern. The apparatus is very simple and may be applied to any ordinary conductor and cistern.

WELL PIPE PULLER. — Jerome S. Cousins, Williamsville, Mich. A base, which may be of heavy plank, is slipped over the pipe, to rest upon the

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well timbers, and around the pipe is an externally threaded tubular screw on which is a beveled cogwheel resting on a collar, the wheel having a hub threaded to fit the screw, and being driven by a pinion on a shaft from any suitable power. Above the tubular screw is a wedge-shaped collar, the wedge entering a clamp by which, as the wedge is forced upward, pivoted dogs clamp the pipe with a pressure corresponding to the pressure on the wedge. The apparatus is strong and inexpensive, may be readily applied, and enables a pipe to be quickly raised.

LOCK.—William W. Davis, East Orange, N. J. This inventor has devised an improvement in that class of locks in which the mechanism is so arranged that when the door is open no parts of the lock will project in such a manner as to catch the person or clothing of those passing near. This lock has no protruding parts, is positive in operation, and little likely to get out of order, and has novel features of internal mechanism.

STERILIZATION.—Albert Hussener, Gelsenkirchen, Germany. For the sterilization of materials in bottles, jars, etc., this inventor has devised an apparatus by which to mechanically close and make perfectly tight against the outer air, by means of a plain flat cover, vessels of any shape intended for preserving articles of food, the vessels and their contents having been previously sterilized by heating in a hot water bath. The apparatus not only effects the closure, but during the process of sterilization exhausts the air from the interior of the vessels, the outside air not being able to penetrate to the interior of the vessels during or subsequent to the process of sterilization.

SIPHON VALVE. — Frederick Booth, Concord, N. H. A valve body is, according to this invention, fitted to slide on the fixed outlet pipe, and is formed at its lower end with inlet openings for the water, and at its upper end with a vent extending downward outside of the valve body to within a short distance of the bottom of the tank. The invention relates to devices for flushing water closets, urinals, etc., and the valve is very effective and noiseless, and arranged to automatically drain the tank whenever the valve is pulled, at the same time using the discharge pipe for an overflow pipe.

KEY RING AND CIGAR CUTTER.—Edward B. Aiguier, Newark, N. J. This combination device is strong and simple, very ornamental, and is arranged to prevent accidental disengagement of a key when the cutter is being used. The ring has its ends spaced apart and is formed of two hinged sections, a cutter formed of a fixed and a movable section being secured to one of the ring sections, its movable section engaging the other ring section.

SCREEN.—George W. Cross, Pittston, Pa. In making screen segments, this invention provides a means whereby the screening surface may be formed integrally with ribs, by upsetting or otherwise treating one of the faces, the ribs being so produced that the screen surface may be smoothly and evenly laid on the spiders or framing, the ribs abutting against the spiders. The ribs and screen segments are also so formed that the ribs may be given more or less pitch, as desired, without interfering with the perfect laying of the ends of the segments upon the spiders.

SHUTTER FASTENER. — Joseph W. Johnson, Point Pleasant, N. J. This improvement comprises two curved bars, each with a pivot hole and an end extension to serve as a handle, and on the convex side two notches or grooves, with a locking device having at one end a transverse perforation to receive a fastening screw, the other end being adapted to engage any of the grooves. The fastening is also a bower, and may be applied to any ordinary blind or shutter, holding it open in such a way that it cannot become loosened by the action of the wind. It is also adapted to hold the blinds at an angle to the window to enable them to act as an awning.

IRONING BOARD ATTACHMENT.—Robert N. Boston, Chestertown, Md. This is a device for firmly holding the neck band and bosom of a shirt while being ironed, and is adjustable to neck bands of different sizes. In using this improvement the neck band is held distended and all wrinkles removed, the adjacent portions of the bosom being also held smooth.

STOVE PIPE JOINT.—Josiah E. Smiley, Smiley, Ohio. This is an improvement designed to facilitate the detachment of sections of pipe when desired. One of the pipe sections has notches in one end and intervening elastic portions provided with spiral ribs, the other section having corresponding spiral grooves arranged oppositely, the grooves and ribs corresponding in arrangement and pitch.

FISH TRAP.—Bernice Wood, Benson, N. C. This invention provides a trap designed to catch a large or small quantity of fish at each operation, and is so arranged as to collect the large fish and allow the small ones to pass through. The invention is also designed to furnish a method of utilizing swamp or waste lands for fish culture, especially land in which small running streams or gulleys are found, which can be easily turned into ponds by damming.

GAME BOARD.—Jay F. Beaman, Antwerp, N. Y. This is an improvement in checker or draught boards, and the playing blocks or spaces are hexagonal, with blank triangular spaces between them. The corners of the playing field are similar, thus avoiding the "double corner," and rendering impossible the well known "parallel move" in such corner, so that a game cannot be made a draw or tie. The game is played in very much the same manner as checkers, but the invention provides for a large sized board for use by a number of players.

MUSTACHE CURLER. — Charles C. Burgio, Brooklyn, N. Y. This is a small and inexpensive device, to be applied in pairs to the ends of the mustache, to curl them without heating, the device being applied to the dry mustache and allowed to remain in position for a few minutes.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

PRAY'S STEAM TABLES AND ENGINE CONSTANTS. By Thomas Pray, Jr., C.C. and M.E. New York: D. Van Nostrand Co. London: E. & F. N. Spon. 1894. Pp. 85. 8vo, cloth. Price $2.

The present work is uniform with "Twenty Years with the Indicator." The author is the well known consulting engineer and electrician of Boston. The value of a table, especially in those relating to steam, is in its accuracy, and the amount of labor necessary to prepare the present work must have been very great. The result is a collection of tables in which nothing is offered which has not been proved. In this book we have in a compact form the most useful data for computations for boiler testing, duty performance of pumping engines, and answers to the many inquiries which spring from the use of the indicator. No theories of any kind are considered or expressed intentionally. Each table is accompanied with explanatory notes showing how problems are worked out in connection with the tables. The work includes steam tables, Regnault's tables, heat of steam, pressure temperature, volume and density of steam, factors of evaporation, hyperbolic logarithms, engine constants, etc.

The American Annual of Photography and Photographic Times Almanac for 1895, of the Scovill & Adams Company (New York), has attained the dignity inherent to a volume of over 500 pages. It has a great variety of information useful to the photographer, either amateur or professional, who wishes to keep pace with the times, including also a carefully compiled selection of standard formulas and useful recipes. The two hundred or more illustrations which embellish its pages likewise present some fine examples of photo-engraving and photo-mechanical printing.

SCIENTIFIC AMERICAN BUILDING EDITION.

NOVEMBER, 1894.—(No. 109.)

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1. Elegant plate in colors showing a cottage at Bronxville, N. Y., recently erected for B. L. Clark, Esq. Two perspective elevations and floor plans. Estimated cost $5,000. Mr. William A. Lambert, architect, New York City. A modern and pleasing design.
2. Plate in colors showing the residence of John Cottier, Esq., at Bensonhurst, L. I. Three perspective elevations and floor plans. Cost $6,750 complete. A good example of Colonial architecture. Messrs. Parfitt Bros., architects, Brooklyn, N. Y.
3. A dwelling at Edison Park, Ill. Cost $1,700. Architect, Mr. F. W. Langworthy, Chicago, Ill. A model design for its class and cost. Two perspective elevations and floor plans.
4. A very attractive residence recently erected for A. C. Garsia, Esq., at Flatbush, L. I. Two perspective elevations and floor plans. Mr. John E. Baker, architect, Newark, N. J. A modern design.
5. An $800 summer cottage built for A. R. Doten, Esq., at Casco Bay, near Portland, Me. Perspective elevation and floor plans. Mr. Antoine Dorticos, architect, Portland, Me.
6. Perspective elevations and floor plans of a handsome residence recently completed for George W. Catt, Esq., at Bensonhurst, L. I. A very picturesque design. Cost $8,100 complete. Mr. S. S. Covert, architect, New York.
7. A church at Short Hills, N. J., built entirely of rubble stone. Estimated cost $6,000. Perspective elevation and floor plan. Messrs. Lamb & Rich, architects, New York City.
8. The house of Francis I. at Abbeville, France.
9. A stable and conservatory attached to the residence of John Cottier, Esq., at Bensonhurst, L. I. Perspective elevation and ground plan. Messrs. Parfitt Bros., architects, Brooklyn, N. Y.
10. A residence at Ardmore, Pa., in the Queen Anne style. Perspective elevation and floor plans. Cost complete $6,750. Architects and builders, Messrs. J. B. Cornell & Sons, Philadelphia, Pa.
11. A cottage at Edgewater, Ill., erected for Edgar Smith, Esq. A unique design in the Colonial style. Cost $7,800 complete. Two perspective elevations and floor plans. Mr. G. W. Maher, architect, Chicago, Ill.
12. An attractive cottage at Bath Beach, Long Island, N. Y., recently erected for G. W. Snook, Esq. Two perspective elevations and floor plans. Mr. Percey Emmett, architect, Bath Beach, Long Island.
13. Miscellaneous contents.—Wood pavement in London. —Preservation of wood.—Methods of constructing chimney flues and pipes at Paris, illustrated.—The passing of red brick.—Long distance house moving.—Carved and fancy mouldings, illustrated.—A new sash lock.—Automatic heat regulation in houses, etc., illustrated.—Woodwork vs. flame.—Curiosities about wood.—Cement water tanks.—An improved hot water heater. illustrated.—How to cool a cellar.—A new woodworking machine, illustrated.—An improved stage bracket iron, illustrated.—Party walls.—Architectural metal ornaments, illustrated.

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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6313) G. M., Los Angeles, asks: What proportional size shall I make the pressure jet and throat of a water jet pump to raise water 12 feet, with a fall of 60 feet? To what fractional height of pressure jet can water be forced by a jet pump, and about what is the percentage of efficiency? Where can I find directions for designing jet pumps? A. The relative areas in a water jet for the conditions as stated should be as 1 to 1·75 with the nozzle drawn to a thin edge and the neck piece with curved or bell-shaped internal surface. The nozzle should be placed just within the commencement of the curve of the neck piece. If well made with smooth frictional surfaces, water can be raised to from one-sixth to one-half the height of the supply head, by varying the proportions of the areas of the nozzle and neck. The quantity raised will vary as the ratio of the areas and inversely as the height. The efficiency depends upon the provision for eliminating the friction of the water in the pipes connecting the ejector, ranging from 50 to 60 per cent. We have no literature on this subject.

(6314) A. C. P. says: I take the liberty to ask for the name of inclosed insect. They have appeared here within the last thirty days in great numbers, and as no one seems to remember of having ever seen them before, they have aroused my curiosity. So would be very thankful for a name for same, also a general explanation of their sudden appearance. A. Answer by C. L. Marlatt, Acting Entomologist United States Department of Agriculture.—The insect referred to is what is generally known throughout the West as the box elder bug (Leptocoris trivittatus, Say). Of late years this insect has been enormously abundant every fall thoughout the upper Mississippi Valley, collecting in great numbers on the sunny sides of buildings and frequently gaining entrance into dwellings in such numbers as to be a serious annoyance to housekeepers. Throughout the summer it may be found in different stages of development, chiefly on the box elder (Negundo aceroides), upon juices extracted from the bark and trunk of which it subsists. In the late summer it may be frequently noticed in dense patches on the trunks of these trees. It also occurs, however, upon other trees, particularly ash. Later, it leaves its summer breeding places and seeks hibernating quarters for the winter, crawling into crevices in walls and outbuildings or wherever it may receive protection from the cold and storms. Wherever they are collected in masses as described they may easily be destroyed by crushing with a stiff brush or by dousing with scalding water or by the use of any of the oily insecticides in very strong dilution.

(6315) B. A. J. says: Will you kindly inform me how halation may be prevented? A. Halation is the term given to the halo which often surrounds windows in photographs of interiors, and blocks up the details. It is, too, often found to occur in landscapes taken in a strong light, the tops of trees and other objects which are surrounded by strong light being lost in a mist, or entirely obliterated. It is caused by reflection from the back of the plate, and occurs most strikingly in plates of the cheap class, which are thinly coated. With very thickly coated plates it rarely occurs, except when taking brightly lighted interiors. To prevent it the back of the plate may be coated with a mixture of powdered burnt sienna, ½ oz.; gum arabic, ½ oz.; glycerine, 1 oz.; water, 5 oz. This is readily washed off before development. A special ready-made preparation is sold for this purpose by Tylar, if preferred. Another way is cut dead black needle paper, or black American cloth, to the size of the plate, coat it with glycerine, and squeegee it on to the back of the plate when placing it in the slide.

(6316) W. C. P. asks how gelatine sheets are made. A. Dissolve fine glue or isinglass in water so that the solution when cold may be consistent. Pour it hot on a plate of glass (previously warmed with steam and slightly greased) fitted in a metallic frame whose edges are just as high as the wafer should be thick. Lay on the surface a second glass plate, also hot and greased, so as to touch every point of the gelatine while resting on the edges of the frame. By its pressure the thin cake is rendered uniform. When the glass plates have cooled, the gelatine will be solid and may be removed. It can then be cut into disks by punches, etc. It can, of course, be colored by adding suitable coloring material, aniline colors, for instance.

TO INVENTORS.

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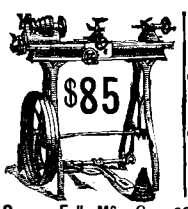

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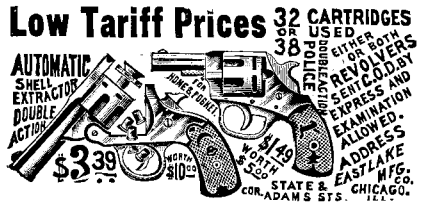

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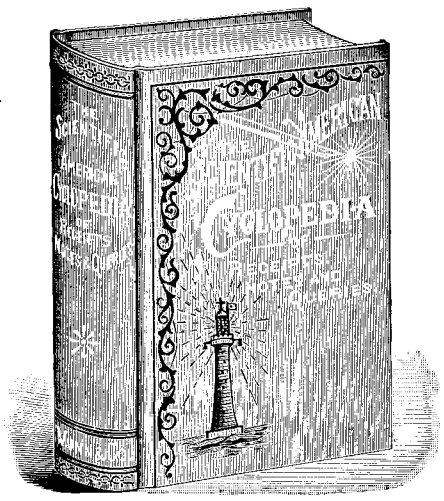

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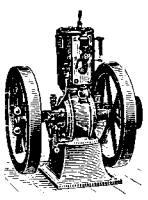

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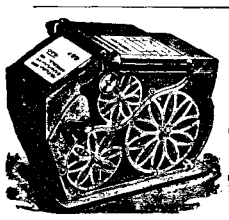

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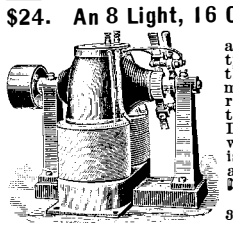

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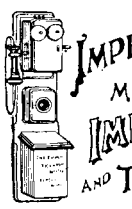

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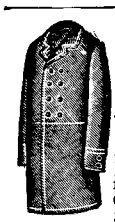

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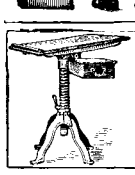

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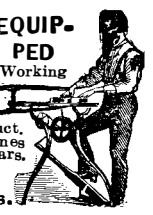

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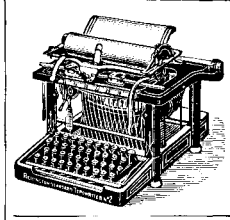

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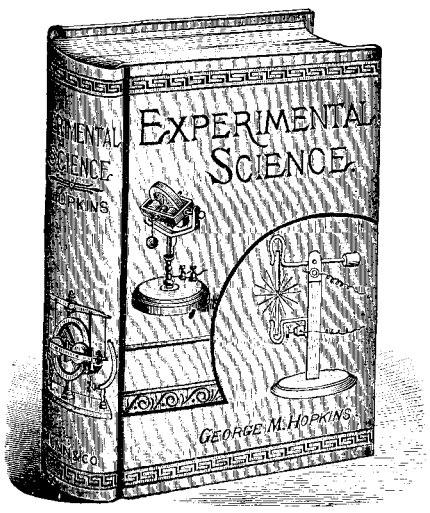

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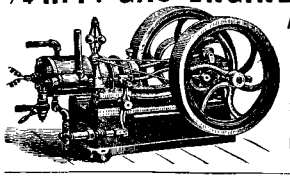

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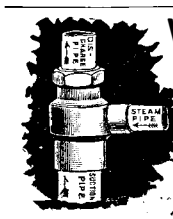

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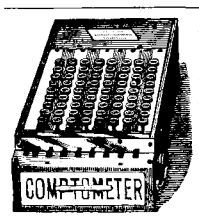

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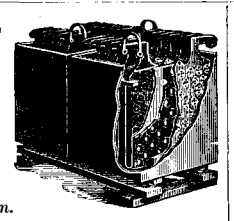

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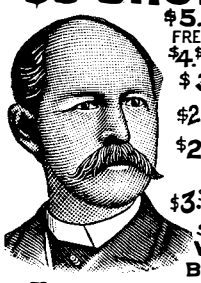

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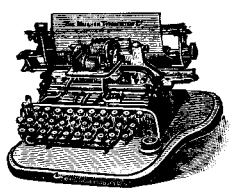

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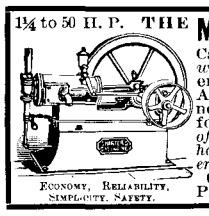

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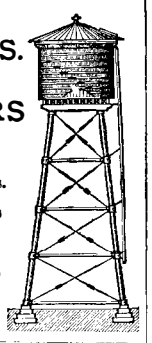

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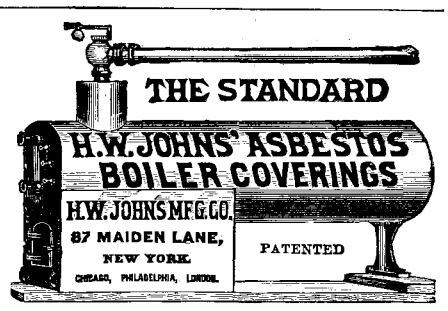

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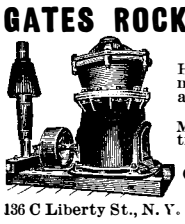

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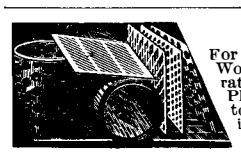

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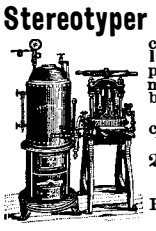

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